NATIONAL PETROLEUM NEWS

Volume 35 | August 4, 1943 | Number 31

TECHNOLOGY DEPT.

News Highlights of the Week

Soften Mid-West for 'Gas' Cut

Strategy for selling mid-westerners on the necessity for lower gasoline rations is mapped. PAW Ickes to talk things over with mid-western congressmen in Chicago, attempting to explain the need. Indications are he'll bump into a hornets' nest. Meantime, agencies handling gasoline supply and rationing go silent as reports circulate that the White House has clamped down on talk until plans are ready. **P. 3.**

Lift Curbs on Gulf Refineries

PAW acts to increase production at Gulf refineries following hurricane which damaged several plants. At the same time, 11 refineries in the Great Lakes area get a "green light" to increase crude runs provided products made from the processing of the additional crude are earmarked for shipment east. **P. 16.**

Study Ruling on Draft of Fathers

PAW advises oil companies who filed Selective Service replacement schedules prior to July 1 to file supplementary schedules as bars are let down on the drafting of fathers of dependent children. **P. 9.**

Portable Pipeline Hits Axis

Details of light portable pipeline which kept rapidly-advancing troops in North Africa and Sicily supplied with gasoline revealed by Shell Oil Co. Method for equalizing pressure worked out by Shell pipeline engineer. **P. 6.**

Colorado Trucking Crisis Delayed

Fees imposed on overloaded trucks by Colorado's highway department tie up traffic but truce is declared until Sept. 7 as Army steps in. ODT Director Eastman issues warning to states not to revive truck barriers. **P. 26.**

Women Hold Key Jobs in Refineries

Women now make up about 10% of the employment lists of petroleum refineries in the nation, according to a survey just completed by the Labor Department's bureau of labor statistics in collaboration with PAW.

The survey, which covered 74 companies representing about one-fourth the personnel of the entire industry, found the so-called "weaker sex" replacing men in such vital positions as gagers, pumpers, operators of cranes, stills, tank car loaders and many others. The girls shown here are technicians hard at work in the laboratory of the Macmillan Petroleum Corp.

For a complete story turn to Page 22.

REFINERY MANAGEMENT AND PETROLEUM CHEMICAL TECHNOLOGY EDITION—In 2 Sections, Section 1

In today's mechanized-motorized warfare, delays or failures caused by mechanical imperfections or trouble, in the air or on the ground, can spell the difference between victory and defeat. Split second timing in the operation of hydraulic equipment aboard light and heavy bombers calls for instantaneous response. Likewise in refueling planes, tanks and trucks, transported fuel supplies must be measured with unfailing accuracy to prevent waste. The building of hydraulic pumps and meters for our fighting forces, therefore, is a job that requires exacting precision and control from original plan right on through to final testing and inspection. That is why the skill, facilities and engineering "Know-how" that for years have given Brodie meters a world-wide reputation for accuracy and dependability have been enlisted in this exacting work.

BRODIE METERS

PETROLEUM METERING EXCLUSIVELY

SINCE 1927

RALPH N. BRODIE CO., Inc.
950 61ST ST., OAKLAND 8, CALIF., U.S.A.
CABLE ADDRESS: "BRODICO"

Division Offices: CHRYSLER BLDG., NEW YORK CITY • 59 E. VAN BUREN, CHICAGO • 302 SOUTH PEARL STREET, DALLAS, TEXAS

REPRESENTATIVES AND STOCKS IN ALL PRINCIPAL CITIES

Facts and Flashes

From the
Technical Service Department
ETHYL CORPORATION

FOR THE WARTIME PETROLEUM REFINER AND MARKETER

1600 West Eight Mile Road
DETROIT, Michigan

Oil change every 60 days for conservation of passenger cars is indicated by laboratory reports recently published. Tests simulating rationed driving conditions show that contamination from sludge, water, rust, etc., calls for frequent changes, even though oil is not worn out.

A unique Army camp contest promotes Preventive Maintenance. An expert crew tours the post daily, flagging down vehicles at random to check tires, lube levels, axle assembly, battery, etc. Any deficiency brings an "X for the Axis" mark against the unit to which vehicle belongs.

Resourcefulness is the keynote on manpower today. Part-time workers can help a lot on a split-shift plan. Supervisory employees are rolling up their own shirt sleeves.

More teamwork between the service station and the garage will also help meet manpower problems. Garages are often glad to send out light work such as grease jobs, spark plug cleaning. Service station can cooperate by sending heavier repair work to garage. This gets work done faster, keeps customers happier. (PS. Even fleet maintenance garages may send out grease jobs when short-handed.)

23% wartime increase in road calls for emergency service reported by AAA. Troubles with starter and ignition cause most of increase. Actually fewer calls due to carelessness of driver (out of gas, lost keys, etc.).

Success of oil company farm meetings last year has stimulated plans for similar meetings this fall. Washington officials look with favor on this means of helping farmers lengthen the life of their present equipment.

New type fuel pump placed inside gasoline tank itself eliminates vapor lock under very high temperature conditions. This development may well raise allowable vapor pressure specifications in post-war fuels even under normal operating conditions.

In World War I, a division used 4,400 horses and 153 motor vehicles of about 3,500 total mechanized horsepower, or a total of about 8,000 available horsepower. Today that same division has about 2,700 vehicles with a total of about 450,000 available horsepower—and all from internal combustion engines. Oil is ammunition. Use wisely.

James Tanham....

Named to War Labor Board

From stenographer to vice-president of the Texas Co. in 22 years is the record of James Tanham, recently named to the National War Labor Board to represent industry. Appointed to the WLB by President Roosevelt July 20, he is now sitting with the board every alternate week. His first session was the week of July 19.

Mr. Tanham was born in Brooklyn, N. Y., Aug. 10, 1895, and received his schooling in New York City. He began his business career as an office boy for a wholesale optical company. He started with the Texas Co. in May, 1919, as a stenographer in the executive offices at New York.

He was made senior clerk in June, 1924, and in June 1926, became executive assistant in the general domestic sales department.

He was appointed assistant to the vice president in charge of domestic sales in November, 1928, and in May, 1933, was made assistant to the company president. He was elected a vice president of his firm in September, 1941.

Mr. Tanham also serves as chairman of the company's Industrial Relations Committee and Committee on Employee Benefits. He is a member of the subcommittee on Post-War Readjustment of the PIWC; chairman of the Committee on Wages and Salary Problems of the National Association of Manufacturers, and a member of the NAM policy committee and speakers committee.

Mr. Tanham enlisted in the Navy May 1, 1917, and served in the chief cable censor's office at the Brooklyn Navy Yard for several months. Then he decided he would be a naval officer. He tried the officers examination on the Mayflower but didn't know anything about navigation. He attempted to "crash" Annapolis, but couldn't get past the gate. He had no better luck seeking admittance to the officers school at Norfolk., So then Sailor Tanham took it the tough way. After a short hitch back in New York with the Navy Auxiliary Service handling transport movements, he went to sea on a cargo ship as cadet in training. That admitted him to the Pelham Bay Officers School and at long last Sailor Tanham became Ensign Tanham. For a time he served on the U. S. S. Oklahoma, famed battleship that was sunk by the Japs in the sneak attack on Pearl Harbor.

The name of Texaco has become known for sound industrial and public relations policy. Mr. Tanham has been chiefly responsible for that program which has established his company in the good-will of hundreds of communities across the country and has resulted in an exceptional management-employe relationship. The experience in this work he brings with him to his new post in Washington.

Mr. Tanham married May Cover, of Farmington, Mo., Nov. 10, 1921. They reside in New York.

NATIONAL PETROLEUM NEWS—Aug. 4, 1943—Vol. XXXV—No. 31. Published every week at 1213 West 3rd St., Cleveland 13, Ohio, U.S.A. Subscription rate $5.00 per year in United States, Mexico, and Pan-American countries; $6.50 Canada and foreign countries. Entered as second class matter Jan. 17, 1910 at Cleveland, O., post office under act of March 3, 1879, by The National Petroleum Publishing Co. Copyright 1943 The National Petroleum Publishing Company.

NATIONAL PETROLEUM NEWS

VOLUME 35 WEDNESDAY, AUGUST 4, 1943 NUMBER 31

Index

Coming Meetings	39
Editor's Page	13
Joint Use Report	38
Markets	40
Personals	48
Production News	34
Refining News	16
Statistics	41
Transportation News	26
War Oil Orders	12
Washington News	9
Womanpower in Refineries	22

Gasoline Stocks at Record Low, Gulf Coast Refiners Report

Special to NPN

HOUSTON—Gasoline stocks at their lowest in history, 1,790,000 bbls. were reported by the 12 refiner members of Gulf Coast Refiners Assn. in an announcement here late last week. The group went on record as expressing deep concern at the continuing reduction of stocks of critical products and other materials, such as motor gasoline and burning oils, in the area.

The association reported its members had been processing crude at the rate of about 2,350,000 bbls. monthly for several months, representing approximately 72% of capacity.

Stocks of both diesel gas oil and No. 2 fuel, at about 750,000 bbls. on July 15, were only slightly below normal for the group but stocks of bunker "C" fuel, reported at 82,000 bbls., were at most about 20% of normal position, according to association records.

Stocks of No. 5 fuel, chiefly produced for the military, were 337,000 bbls. on July 15, while stocks of all products totaled 3,340,000 bbls.—representing a decrease slightly more than 600,000 bbls. from June 15.

No Shortage for Essential Use

NPN News Bureau

WASHINGTON — Brig. Gen. Covell, chief of Army's fuels and lubricants division, told a joint congressional committee Aug. 3 that there is "no shortage of liquid fuels for military and essential uses."

Previously, Deputy PAW Davies had declared the military is getting all the oil it needs.

Sen. Gurney, S. Dak., asked if the Army could wage the war more intensely if a quarter or half a million more gallons of products could be brought to the East Coast. Mr. Davies indicated not, saying "it has been a matter of transportation rather than amount of oil available for use." The question, he said, is a lack of ships to move oil overseas.

Soften Mid-West for 'Gas' Cut

Ickes to Talk Over Equalization with Mid-West Congressmen, Attempt to Show Why Cut Must be Made. FDR Muffles Statements by Agencies

NPN Staff Special

WASHINGTON—There is not enough crude oil being produced east of the Rocky Mountains to meet military requirements and civilian consumption of gasoline at the present rate of demand.

That's the message PAW Ickes is taking to the Aug. 5 meeting of mid-western congressmen at Chicago who want to know why it is necessary to reduce gasoline rations in Districts 2 and 3 to provide more supplies for District 1.

Besides this, gasoline yields have been so reduced by making of additional fuel oil and war products that each barrel of crude is yielding 5 gal. less gasoline now than in pre-war days. Figuring that refinery runs are now about one barrel of crude per week per passenger car, that means the average motorist is losing 260 gal. or 3900 miles annually because of changes brought on by the war. Subtracting that 3900 miles from the average annual mileage, as determined by the Baruch committee a year ago, brings average mileage to around 5000 miles a year. Strangely enough, that is just the objective of the OPA-PAW program for equalizing gasoline rations.

An alternative, which Mr. Ickes may or may not mention at Chicago, is that a re-arrangement of supply sources, with more tankers becoming available, might ease the burden.

White House Clamps on Lid

All agencies dealing with gasoline supply, transportation and rationing have become suddenly uncommunicative. Reports are that the White House has clamped on the lid, presumably to prevent an intra-agency row.

But PAW Ickes had promised the mid-western congressional group some weeks ago that he wouldn't act to reduce consumption in that area without first consulting them. Hence, when reminded of this by Congressman Brown of Ohio, Mr. Ickes suggested a meeting in Chicago. After that meeting, PAW will announce its certifications of gasoline supplies available in Districts 1, 2 and 3.

Mr. Ickes is walking into a hornet's nest, if indications here are any guide. Mid-western congressmen and senators have been assailing the ration cut out there as unnecessary. They cite Mr. Ickes' frequent statements that transportation, not supply, was the problem. He was slow to admit that transportation had caught up with supply. But at Chicago he is expected to come out with the blunt statement that there isn't enough oil available in this country to keep consumption up to present overall levels.

On the other hand, eastern comgressmen are demanding that "something must be done at once" to relieve the East. A "rump session" of eastern congressmen is threatened unless PAW acts immediately to cut the Mid-West to make more supplies available for District 1.

Whether or not he will bring up the controversial issue of foreign oil remains to be seen. But the oil shortage rapidly is becoming such a political hot potato that the Roosevelt administration may take direct action to relieve the situation by use of foreign oil.

OPA is Quiet About Plans

OPA has kept mum about its plans on coupon values and such to follow PAW's readjustment of supplies among Districts 1, 2 and 3.

Some cynically-minded observers have suggested that PAW might delay its certifications until a few days before Aug. 16 and make them effective as of that date, hoping to embarrass OPA which couldn't get its plans worked out quickly enough to put them into effect. But the likelihood is that PAW will cooperate with OPA so that plenty of time is given for arranging rationing machinery

(*Continued on p.* 11)

Mid-West Storm Brews Over Gasoline Cut

NPN News Bureau

CHICAGO — There is evidence in the wind that the Mid-West is not going to take the coming cut in gasoline rations lying down. There is considerable public feeling in this area that rationing should be equalized—but that the East should be brought up to the Mid-West level as transportation becomes available. There is a belief that products can be had if properly handled and not deliberately shorted.

In the background there is also the thought that perhaps it would be wise to let PAW Ickes and the OPA professors go ahead and cut—cut—to their heart's content. The public indigestion that would follow then would cause a burping up of the entire unsavory mess, and a good healthy clean out would result.

Mid-Western legislative committees started stirring things up on Monday when the committee of 6 Illinoisans began calling witnesses from industry committees and government agencies to testify at their public hearing. Sen. Clark from Missouri was to follow with another hearing at Kansas City on August 3 postponed from last week.

Date May Be Delayed

NPN has learned authoritatively that the date for the cut has been set, but that it probably will have to be moved back because OPA cannot get its machinery ready in time to start execution—a good $64 word in view of the numerous charges OPA has been preferring

against individual motorists and service station operators in the Mid-West. A few cases have been heard, but the large majority are still to be decided.

In addition to the gasoline rationing violations, several local fuel oil dealers and distributors are now being investigated and filing of charges against them is anticipated.

Two hundred municipal, circuit and superior court judges and prominent lawyers, members of the Chicago Bar Assn., have volunteered to act in an administrative capacity to hear rationing violation cases of all kinds in the Chicago area, according to OPA Hearing Commissioner McFarland's office. Their recommendations, after hearing the cases, are to be reviewed by Mr. McFarland who will make decisions and assess penalties, his office said.

Seek To Boost Output

But harking back to the fundamentals of future prospects of rationing, it is evident from the great activity of the many District 2 industry committees at meetings held at industry and PAW, District 2, headquarters so far this month, that a big effort is being made to increase crude runs and product output to stave off or minimize rationing restrictions in the Mid-West.

However, the meetings so far have not produced much in the way of further products. The crude oil supply advisory committee has done a little shuffling around of quantities of crude recommended to be run by individual refiners in District 2 during August, but the grand total was changed very little from crude allocations by PAW for July, NPN was told, so not much change is anticipated in PAW's allocations for August when they are announced.

Transportation and barge committees apparently are trying to get more products in—or trying to figure out in advance the questions and answers for legislative inquirers.

'Surprise' Action Sought

Some District 1 visitors who were here last week will be surprised if the reduction in coupon values here is more than 1 gal. (that is 3 gal. for "A" cards). They want the cut, however, to be made overnight, without notice, and were of the opinion that this surprise action would save 1,300,000 gal. of gasoline as motorists would not have an opportunity to fill their tanks on the 4 gal. per coupon basis.

From more than one source, it was authoritatively said that a reduction of 1 gal. in "A" coupon value in Districts 2 and 3 would produce 100,000 b/d of gasoline for shipment to the East Coast. If the cut were made in Distric 2 only, 60,000 b/d would result, and in District 3, 40,000 b/d.

Some surprise has been expressed here at the enormous increase in gasoline consumption in the state of Texas, as reflected in gasoline tax reports, and some "serious jokes" have been made about Texas' secession from the union when the ration cut is applied, with much "public clamor" coming also from Oklahoma and other states to the north of them, as well as from this area.

District 2, PAW office here, is said to be writing production, refining and consumption figures on gun wads, which it can fire at legislators and the public alike when the outburst of protests breaks.

Where and when the situation will clear up, the Mid-West wonders.

Mid-West Oil Roundup . . .

Legislators Wake Up to Kangaroo Court Methods

By EARL LAMM, NPN Staff Writer

"This is the most important thing we've run into. OPA puts a man out of business—closes him up—without due process of law in a regular court under the judicial branch of the government as guaranteed by the Constitution of the U. S. It sets OPA up as a commissar. I'm certain that congress did not intend to delegate that authority to the Presiden under the first, second or any other war powers act."

Thus spoke a member of the joint Illinois legislative committee investigating the petroleum situation at hearings here Aug. 2. This legislator had just listened open-mouthed to testimony surrounding punishment of service station operators for alleged violation of gasoline rationing regulations. (OPA regional office here has cited 124 stations for violations and 21 hearings are scheduled.)

Waking up to OPA's kangaroo court methods, the Illinois legislators indicated they would dig further into the matter, probably at hearings later this week.

Testimony which stiffened the Illinois legislators in their chairs was given by B. L. Meece, sales manager of Globe Oil & Refining Co. He told the committee that after completion of the hearing against Joliet Oil Corp., a Globe customer, transcript of the testimony was changed to include mention of Globe as Joliet's supplier. Globe's attorney defended the station operator at the Joliet hearing, which was brought on and complicated, testimony indicated, by the operator's refusal to join the teamster's union. Meece said OPA got its alleged evidence of violation from the union.

At the hearing, OPA Regional Hearing Commissioner W. M. McFarland testified that he sat in on violation cases as an "administrative tribunal" (not as a judge in court) under authority delegated to the executive branch of the federal government by the War Powers Act. That was when the Illinois legislator spoke his piece.

* * *

Independent river terminal operators are not getting a square deal from either PAW, ODT, District 2 industry committees, or major oil companies, according to Henry H. Robinson, Dubuque, Iowa. He came to NPN's Chicago office on July 30, to tell his story.

Mr. Robinson operates the Capitol Oil Co. with a Mississippi river terminal of 2,000,000 gal. storage capacity. There are two 24,000-bbl. steel tanks, equipped with efficient pumps that load 1200 gal. per minute, he said.

"But one of the tanks has not had a thing in it since last February," he declared. "This week I received a registered letter from my supplier, National Refining Co. of Cleveland, limiting me to 500,000 gal. per month. I now handle only regular gasoline.

Charges Juggling of Zone 11

"In addition to that, major oil companies had Zone 11, in which I am located, laid out to include their terminals so they can stay within the law and yet back-haul, cross-haul and deliver products by truck transport right in Dubuque and all around me. Major oil company barges go up the Mississippi right past my door and haul products 70 or 80 miles farther north, unload it at the terminal there, then truck it back down to Dubuque.

"They may be within the law, but they are not within the spirit of regulations and are wasting rubber, motor fuel and manpower. Their products could be handled through my terminal with a saving of those things, which have been declared essential. I have offered to work out exchanges and trades or whatever it takes and have been refused. More than that, two barges loaded with heavy fuel oil for river boats were tied up at my dock during the entire months of May and June, and I had to move them every time other barges or boats came to my place so they would have room to unload. Those two government barges (Federal Barge Lines), holding 400,000 gal. or about that, could have stored their loads of bunker fuel in my empty tank, and gone about the business of hauling products that are so badly needed everywhere, including the East Coast. As it was, they stood idle two whole months.

"But independent river terminal operators are in the same fix as independent oil producers, refiners, distributors and service station operators. It's all part of a preconceived plot to give the major oil companies control of the industry throughout the Mid-West, like the monopoly they have brought about during the past few years in California.

"In District 1, independents are about out of the picture because of tight restrictions, and it's now time to wring them out of the Mid-West by killing off their business through deeper rationing and tighter regulations. As soon as that's done, prices will be increased and the squeeze lifted. You watch and see!"

When NPN checked up at the PAW office in Chicago, following a call there on July 30 by Mr. Robinson, it was admitted that the Dubuque terminal operator had a just cause for complaint and that something should be done about it, "but we're tied up now on things so many times more important." Mr. Robinson had been referred to an industry committee representative, whom he said he had been unable to contact so far. He did, however, contact ODT, regarding the back haul trucking, but told NPN on July 31 that if results came at all action would be slow. "I'm going back down there next week and I'm going to fight this thing through!"

* * *

Individually branded marketers and their suppliers will meet at the Morrison Hotel, Chicago, at 10 a.m., Aug. 10, according to announcement of Phil T. Williams, Indianapolis, chairman of the Individually Branded Petroleum Assn. of America.

Rejuvenation of the association is in prospect, Mr. Williams said.

He declared that if all companies were sus-

taining equal loss in gallonage, the situation would be more tolerable, but facts are that individually branded marketers are suffering 60% loss while major company service stations have lost only 15% to 18% in gallonage, he said.

"This is evidence that something is wrong, and something must be done about it. . . . Individually branded marketers are definitely the casualties."

I.B.P.A.A. and suppliers are greatly concerned over prospects of further restricted rationing, shortage of supply, and enforcement of the 72 hour service station regulations (PAO 4), according to Mr. Williams.

° ° °

Following meetings of various committees and subcommittees at oil industry headquarters last week, W. W. Vandeveer, PAW's new director-in-charge of District 2, invited several of the members into his office for a private session with 3 visitors from District 1.

The eastern visitors were H. D. Carter, PAW District 1 director of supply; C. V. Dowd, of the tank car subcommittee; and C. J. Skidmore, representing District 1 marketing committee chairman J. A. Brown. H. W. Dodge, director-in-charge of District 1, was supposed to be there, but he was called to Washington instead. Sherman Archbold, PAW chief of inland waterways, was present however.

Questions most likely asked by the East Coast representatives were:

"How about some more gasoline? Our 'A's' are only worth 1½ gal., you know."

"How about seeing your books on supply and demand—and tell us where your surplus stocks are. There are some barges and lake tankers not working. Fill them up and shoot them to us!—and tank cars, too. Lot of them lying around idle since completion of the last leg of the Big Inch."

"Are you keeping the Lakes tankers filled up?"

° ° °

Southwestern railroads are satisfied with the fuel oil supply, although they feel the gravity is a little light.

A committee of 35 PAW, oil industry, and railroad representatives met in the PAW conference room in Chicago, July 28-29, to settle who was going to get fuel oil from where. Supply is easier than it has been for some time, a committee spokesman said, but "we are trying to save tank car mileage by making allocations to railroads from the nearest stocks, based on reports from the refiners."

Effort is also being made to cut down on the amount of right-of-way weed burning oil used.

I. W. Liddell, PAW transportation division, headed the group. Others present included Herman Fowler and R. C. Sauer of PAW's marketing and petroleum supply divisions; George Bowes and E. H. Frueh, District 2 and 3 supply and distribution committees; William Farrell and Charles H. Hoinville, American Assn. of Railroads, plus the railroad men themselves.

° ° °

Wisconsin's anti-black market bill, passed by the legislature recently, became a law July 27 when Acting Gov. Goodland signed it midst much OPA ceremony. Raymond S. McKeough, OPA regional administrator from Chicago, and members of his staff "had everything but the brass band" present. The governor called the OPA show "nonsense" and was quoted in the Madison *Capital Times* as saying: "This must be an important bill, but who's going to enforce it?" An OPA official said that was up to the state, and the governor replied: "Yes, but some laws can't be enforced."

Nevertheless, he attached his signature, using 2 pens, which the OPAers claimed as souvenirs. The new law provides $250 fine or 90 days imprisonment for buyers or sellers of rationed black market products, including petroleum.

Atlantic Coast

Forecasts Doom of 'Snoopers'

William J. Gottlieb, New York Auto Club President, Says 'A' Card Holders Will Have Complete Discretion Under Equalization Program

By Henry Ozanne,
NPN Staff Writer

NEW YORK—Purported details of the new gasoline rationing plan were announced here July 30 by William J. Gottlieb, president of the Automobile Club of New York. Mr. Gottlieb said he could reveal on "unquestionable authority" that the new program would go into effect in two weeks and would embody the following three main provisions:

1.—Basic weekly gasoline ration for family use to be allocated to every passenger car regardless of geographical or occupational considerations; such basic ration to be used at the full discretion of the car owner. This would mean the end of the OPA ban on non-essential driving in the East.

2.—"A" coupons will not be included in occupational driving. Present rule is to designate 150 miles per month of "A" coupons for occupational driving before issuance of supplemental rations.

3.—Face value and actual "gasoline pump value" of each denomination of coupons will be the same for all the country east of the Rocky Mountains.

Mr. Gottlieb said "A" coupons would be raised in value but that the amount had not yet been determined. "B" and "C" coupons, he said, are favored for a uniform 3 gals. a month throughout the rationed territory.

Mr. Gottlieb also proposed overhauling of OPA in order to curb black market gasoline sales. He said he would recommend to OPA Chief Brown that penalties for illegal gasoline sales "be strengthened to include sentences and stiff fines."

° ° °

Northern New Jersey drivers again crowded the highways last Sunday in disregard of the pleasure-driving ban, although OPA officials said road patrols had resumed after virtually a two-week lapse. John Dressler of Hackensack, president of the New Jersey Gasoline Retailers Assn., said:

"The so-called pleasure ban was effective only as long as it was possible to employ the scare technique. New Jersey motorists have gotten over being scared."

New York District OPA reported it had 100 agents busy over the weekend, but bridge and tunnel thoroughfares into the city were crowded Saturday and Sunday. Augustus B. Weller, chairman of the Nassau (Long Island) County War and Price Rationing Board admitted that OPA "snooping" tactics had bogged down of their own weight. Mr. Weller wrote to his Washington chiefs:

"Local police are having too much trouble taking care of traffic to even think of possible violators, and if an attempt were made to report such violations, the volume would exceed the capacity of the rationing boards."

Mr. Weller, commenting on Washington's refusal to allow travel to the beaches in lieu of a vacation trip, said: "This convinces me how little the practical gasoline problem is understood in Washington."

° ° °

Motorists in Traffic Court here last week forgot their own troubles in their glee over conviction of an OPA "snooper" who was fined $4 for improper car parking. Irving Tick, the OPA agent, presented to court a note from the chief OPA inspector asking leniency, and Mr. Tick himself argued that he was on "extremely confidential" government business when his car was tagged. Magistrate Mahoney, in imposing the fine, said: "Well, there's nothing confidential about your conviction!"

Meanwhile protests continued to rise against the pleasure-driving ban. The 14,000 war plant workers of Rome (N.Y.) sent a plea to OPA Chief Brown to allow individual discretion in use of "A" coupons. The appeal was signed by the labor-management committees of nine war factories.

The village board of Amityville, Long Island, voted to admit autos to the municipal beach on Great South Bay. The village mayor and board of trustees said they could see no difference between their own action and OPA's issuance of vacation driving permits.

New York City's Park Commissioner Moses renewed his plea to OPA to lift the driving ban in an 8-word telegram: "There are only 40 days of summer left".

The driving ban cut $58,394 from the Delaware River Bridge toll in June, it was announced.

° ° °

Sol A. Herzog, counsel for the Eastern States Gasoline Dealer Assn., charged here last Saturday that the gasoline drought in the East has promoted "a scare campaign" prompting people to get rid of their cars. During the last two months, he said, 15,000 automobiles have been sold in this area for transfer to other parts of the country.

° ° °

Federal indictments were returned here July 28 against 10 persons and information was presented against 40 others as the government struck its heaviest blow at alleged black market gasoline operators. The defendants, who are gasoline station owners, are accused of disposing of gasoline coupons for 1,050,000 gals. since last October. Many of the coupons are declared counterfeit. The indictments

were obtained under a law that was invoked for the first time in this district and provides maximum penalty of two years imprisonment and $10,000 fine.

The argument of the government is that the defendants conspired to defraud the U.S. of a governmental function directly connected with the war. The point at issue is the right of the government to control use and operation of motor vehicles equipped with tires to the end that vital rubber and gasoline supplies be conserved "for the purpose of keeping the armed forces of the United States fighting."

° ° °

Following the task of redrafting Directive 59, PAW District 1 headquarters issued the following statement:

"On June 10, 1943 the petroleum industry formally presented to the District 1 office of the Petroleum Administration for War in New York a proposed new Directive 59. Mr. H. W. Dodge, director in charge, with members of the staff convened the industry in five different cities within District 1, explained the new directive to those assembled and asked their recommendation as to its approval and adoption. Those present who felt that further changes should be made in the directive were asked to put their suggestions in writing. When these suggestions were received, Mr. Dodge decided that they were so important and so many that the new directive should not be approved but it should be returned to the industry with the comments and criticisms received for further consideration by the industry.

"The industry has carefully considered each comment and suggestion received. It has adopted and incorporated in the new directive the suggestions which in their judgment improve the document. The drafting committee on July 30 submitted the finished document to Robert H. Colley, acting chairman, for the attention of the general committee. When approved by the general committee the new Directive 59 will again be presented to the district office of the Petroleum Administration for War for approval and adoption."

Portable Pipeline Hits Axis

Shell Reveals Invention Carrying Gasoline and Water to Battle Fronts; Sicily and North Africa Drives Show It Works When 'Blitz' Is Hottest

NPN News Bureau

NEW YORK—One of the petroleum industry's greatest contributions to the war effort was revealed here this week with the announcement of the military portable pipeline now serving Allied armies in the war's crucial campaigns.

Shell Oil Co., Inc., with army permission, disclosed the new invention by Sydney S. Smith, manager of the company's products pipeline department, by which oil and gasoline are brought right up to the battle fronts. The use of the device in the North African and Sicilian campaigns is given a large measure of credit in speeding the United Nations' greatest victories so far in the war.

In the North African campaign portable pipeline carried both water and gasoline in separate lines.

The new "front-line" pipeline consists of 20-foot sections of 4-inch flexible light steel pipe, with pumping stations at 10-mile intervals, and with all the equipment—pipes, couplings and pumps—transported on trucks or trailers. The pipeline needs no trenches. It follows the contour of the terrain, and is completely automatic in operation and easily handled by army field crews.

When the present war broke out, Shell's pipe expert, Mr. Smith, thought over the huge transportation difficulties which the army would face in any "blitz" campaign. The sheer weight of petroleum products in bulk presented an appalling problem, disregarding the danger of air attack.

War of Oil and Transport

"Sooner or later", said Mr. Smith, "We're going to have to solve that problem. This war is a war of oil and transportation."

As a patriotic contribution to his country's defense, Mr. Smith worked out and put on a paper design for a portable pipeline, knowing that some day American safety probably would hinge on his invention. He showed his plan to Norman J. McGaw, Shell vice president in charge of transportation and supplies, who authorized a fund of $10,000 for portable pipeline experimentation in the Middle West.

The plan was ready but untested when, in 1941, the general manager of Shell's interests in South China raised the question of oil transportation over the Burma Road. The Smith plan was studied and the matter was taken up personally by Alexander Fraser, Shell president. The plan was accepted by the Chinese Defense Supplies Corp. and application for construction steel was made under Lend-Lease.

Much of the pipe already had been accumulated for export when army authorities decided that the idea was vital for American operations abroad. John H. Hall, superintendent of Shell's East Line, under Mr. Smith, was loaned to the Chinese Government to explore possibility of installing a line along the Burma Road.

Tests were made by the army in the Shenandoah Valley, in course of which a flood washed out a bridge over which the portable pipeline was slung. The serviceability of the pipe was demonstrated when the bridge remained suspended on the pipeline alone with connections unbroken. The army accepted the plan with slight alteration.

With the fall of the Burma Road to the Japanese, all the portable pipeline supplies were diverted to the European theater of operations.

In the Tunisian campaign four special units of the line were used, ranging from 75 to 300 miles in length. The rapid sweep of Allied forces through the African desert is largely credited to the oil that kept pace with the army's smashing gains, flowing up to the front through a 4-inch line.

Serves in Sicily Too

In the Sicilian campaign, it is reported that one of the principal reasons for the swift progress of Allied troops is the same portable pipeline moving across the countryside almost as fast as the Yanks and their Allies drive ahead.

The portable pipeline has a capacity of 6,000 b/d (25,200 gal.). Another of its important features is the rapid rate at which it can be laid—10 to 30 miles a day by unskilled or regular army field personnel. It can be operated under supervision of only a few trained engineers and actually handled by field crews. No communication system is necessary because of the automatic cut-off, and because a separate line is laid for each type of product thereby avoiding complications under battle-front conditions.

The pipe is about half the weight of regular pipe or only 5 lbs. to a foot, and hence can be readily lifted and carried by one man. It is spiral welded, with the ends grooved for Victaulic couplings. So flexible is the pipe that it moved about simply by picking up an end by truck and hauling it away. In tests—and perhaps under actual war conditions—it

Inventor Sydney S. Smith directs the joining of two lengths of the light, portable pipeline he developed. The line contributed greatly to the rapid advance of American forces in the African and Sicilian campaigns. One man can handle a 20-ft. length without difficulty

has been wrapped around trees, bent over hills, curved across streams without impairing its functioning.

The total weight of the system per mile, including pumping stations, is only about 13 tons. Maximum rate of filling the line is approximately 2.5 miles per hour.

Costs $3,000 Per Mile

The cost of the material (not including transportation or labor) is about $3000 per mile.

Gasoline-fueled engines operate the pumps. These were originally mounted on rubber-tired trailers but the army has now placed them on skids. A pumping station if put out of action can be repaired in a few hours. During the interval the capacity of the line is reduced only about 30% and returns to normal on installation of the new unit. The system is designed to work under a temperature range from —40 degrees to 130 degrees.

The pipe oxidizes quickly to a dull grey once laid and presents a poor target from the air to enemy bombers. Pumping stations are camouflaged and noise-deadened. One-third of the pumping stations can be knocked out and the system still will function. Any two adjacent stations can go out and the system will continue to operate.

Pressure through the line is about 600 lbs. per inch, but the pipe will stand temporary "surge" pressures up to 800 lbs. or more.

When the line is broken by bombing or gunfire, patrol crews quickly locate the break, cut off the valves and loop in a replacement section of pipe—all in one to four hours. The pipe sections are coupled, not welded or screwed in, thus facilitating rapid interchange.

Brig. Gen. R. F. Fowler, chief of the Army Supply Division, expressed his compliments to Mr. Smith in these words:

"The portable pipeline system which you designed and developed has been a material contribution to the success of our armies in the field. The aid you have given the engineers of the Supply Division in establishing manufacturing facilities and in testing the design has enabled us to deliver the equipment to the field in time to meet an urgent demand.

"The whole-hearted cooperation you have given in connection with the procurement of this pipeline equipment, without financial compensation, reflects patriotism of the highest type and merits my sincere commendation."

Neither Mr. Smith nor Shell receives any royalties, fees, or other remuneration for the invention.

New Problem for Oil Company—Rounding Up Glass Jars

NPN News Bureau

CLEVELAND — Not so long ago the scarcity of steel drums gave the oil industry no end of trouble. And now it's glass jars, quart size.

This new complication has prompted Valvoline Oil Co. to announce, effective at once, a deposit charge of 75c for a case of 12 jars. The deposit is to be refunded on return in a minimum of 9 case lots, freight collect, to the company's refinery at Butler, Pa. The objective is to establish a revolving pool of Valvoline quart jars.

Prior to Pearl Harbor the company sold its product in tin cans, but when the Japs cornered the tin supply Valvoline shifted to glass.

Lately there has been another competitor—the victory gardener who wants glass jars.

Result is that the glass industry is heavily oversold. OPA has given its blessings to the revolving pool, Valvoline says.

Self-Trained Engineer is Pipeline's Inventor

An unusual setting for a war story. A conference room on the 64th floor of a New York skyscraper, looking out over green Central Park. Not a man in the room was in uniform.

But the story told there to New York newspapermen answered a wartime question that has puzzled many a military commentator: "How could the U. S. Army move up so fast in its African and Sicilian campaigns?"

The answer came from a slim, quiet-speaking man, Sydney S. Smith, manager of products pipelines for Shell Oil Co., Inc. He told of his invention of a portable pipeline for military operations which is laid at the rate of 28 to 30 miles a day in the rear of advancing troops, assuring them of supplies of gasoline for their tanks, jeeps, trucks and other equipment.

Self-Trained Engineer

"Sid" Smith is an engineer by self-training. His education at small Marietta (Ohio) College was in mathematics, physics and journalism. He took journalism only because he liked the professor who taught the course. This professor, so "Sid" says, was the best "debunker" he ever knew.

"Sid" Smith was a first lieutenant in the Balloon Corps in World War I. After the war he and his father organized an oil-producing company in the Mid-Continent and were going in a big way when the depression of 1929 wiped them out. "Sid" worked in a radio shop while he was finding his bearings.

Then in 1934 he advertised under separate listings his capacities as engineering executive and office manager. A Shell Oil division manager answered one of the ads and, so "Sid" says, he had an awful time in the interview until he found out which ad he was supposed to be qualifying for.

"Sid" was in the natural gasoline division of Shell Oil for a few years. His engineering studies were always along the line of trying out new ideas—ideas other people said wouldn't work. His early theories on the design and operation of rectifying columns are now standard practice.

In 1938 he became manager of product pipelines for Shell. Among his improvements —besides the portable military pipeline—is a method now in use for dispatching products through lines in the same manner that trains are run on schedules. He started to work on the portable pipeline before Pearl Harbor. If the Japs hadn't taken the Burma Road, the first such line would have been used to replace trucks to move gasoline over that route. The Army already has bought many millions of dollars worth of equipment for his portable pipeline. Neither "Sid" Smith nor Shell Oil Co. has received a cent in royalties or fees for the invention. It's "Sid's" contribution to the war effort.

Experts Say 'Gas' Tax May Take Back Seat In Revenue of States

NPN News Bureau

CLEVELAND—Gasoline taxes collected by the states for April, 1943, latest month available, showed a decline of 20% below April, 1942, according to Recent Trends in State Revenues, a research report of the Federation of Tax Administrators.

Receipts continue to decline, particularly in view of the pleasure driving ban imposed in May in the Eastern shortage area, and the Federation warns the states that the gasoline tax, for many years the most important single source of revenue, soon may have to be relegated to a position of secondary importance for the duration.

In contrast to declining gasoline revenues, however, the administrators' survey showed that the war has stimulated other tax sources and the general fiscal picture of the states is good with practically all having large surpluses and many setting aside sizeable reserves to meet postwar problems.

Among tax sources showing improved yields were income taxes, sales taxes, and excises on cigarettes and alcoholic beverages.

Tobacco Taxes Up

Tobacco tax revenues have increased from $97,000,000 in 1939 to $130,800,000 in fiscal 1942.

For the first quarter of 1943 state income tax receipts totaled $184,900,000 compared with $145,100,000 for the first quarter of 1942.

Similar increases were shown in the alcoholic beverage fields. These revenues were up 19% from 1941 to 1942, and according to first quarter reports for 1943, continue to rise. Received in 1941 was $196,000,000 and in 1942 $237,000,000.

Gasoline rationing started in the East on May 15, 1942, and became nationwide on Dec. 1, 1942. Despite this, motor fuel taxes for 1942 still constituted the most important single source of state revenue, providing almost one-fourth (24.2%) of total state-collected taxes, excluding unemployment compensation taxes, the survey showed.

Although rationing did not go into effect in the East until May, gasoline tax yields began to decline in March, 1942, marking the first falling off in two years. Since the downward trend was at first slow and tentative compilation of gasoline tax revenues at the end of the year showed a total collection for 1942 of $942,200,000 up 4% over 1941 receipts of $908,700,000.

Sight Real Impact in '43

The real impact of declining gasoline tax revenues, of course, is to be felt during 1943. In December, reflecting increased November sales because of the imminence of nationwide rationing, receipts fell off only 9% below the high collections of December, 1941. Effects of nationwide rationing were reflected for the first time, therefore, in January of this year when receipts were off 34.2% compared with January of 1942; February declines were as steep as 38% in some states.

For March, 1943, just a year after the tendency toward decreased revenues was noted, 47 states reported a yield of only $41,100,000 as compared with $59,000,000 in March, 1942, a decrease of almost 30%.

Strike Decision Hits Union's Unlawful Seizure

National Labor Relations Board Finding in Mid-Continent Petroleum Corp. Strike Case Gives Company Clean Slate. Union Tactics Scored

R. H. Willis, vice-president and general counsel of Mid-Continent Petroleum Corp., Tulsa, Okla., has distributed printed copies of the National Labor Relation Board's decision in the Mid-Continent refinery strike case which NLRB decided in the company's favor. The board found the strikers had unlawfully seized the company's property and pointed to errors in the conduct of its trial examiner. Following herewith is a digest of the board's decision—Ed.

IN SETTING forth the facts on which it based its decision for the Mid-Continent Petroleum Corp., the National Labor Relations Board gave considerable detail as to how the striking employes of four years ago seized and took physical possession of the refinery. The board also criticized and rejected the rulings of the trial examiner, and pointed out how his rulings had kept out of the record a good bit of the defense of the corporation. The National Labor Relations Board held for the company on all points.

This decision was rendered June 7th of this year against the Oil Workers International Union, formerly of the A.F. of L. and now with the CIO. This decision was in the strike begun just before Christmas, 1938, in which the plant was seized and held for several days by the strikers, until driven off by the Oklahoma National Guard. Hearings and arguments have been going on ever since.

Finds No Unfair Practices

In its decision, the board finds that the Mid-Continent Petroleum Corp. and Cosden Pipe Line Co., against whom the strike was held, while operating physically in Oklahoma, are, by reason of most of the business going out of the state, in interstate commerce. It holds that the Oil Workers International Union is a labor organization within the meaning of the law; that the Mid-Continent Petroleum Corp. had not engaged in unfair labor practices; and that, in refusing to reinstate the employes it had fired for participating in unlawful acts in the seizure of the plant, the company had not been guilty of unfair labor practices. The board orders the complaint of the union against the company dismissed.

In its recital of the facts leading up to the strike, the board says that the union and company began negotiations for a contract in 1937; that such contract was made March 17 of that year; a grievance committee of representatives of the four locals of the union working on the company property had many meetings on various grievances. On May 2, 1938, a number of union men had a two-day sitdown strike, unauthorized by the union because, in their opinion, grievances hadn't been quickly handled.

Union's Demands Cited

In January of 1938 the union began further negotiations, in which it asked for:

1—A change in wage classifications;
2—Liberalization of the vacation policy;
3—A more comprehensive system of seniority;
4—A check-off of union dues;
5—A selection of a mutually-chosen arbitrator for the disposition of grievances.

On June 2 the union voted a strike, but it was not called. On October 31 the union again polled its members and a strike was again authorized, but none called. But December 22, 1938, in response to a third vote, a strike call was issued and approximately 600 of 1200 employes at the refinery struck.

Twenty to 30 strikers entered the turbine plant and pulled the switches to the three turbines supplying electricity, which darkened the whole plant and stopped all operations dependent on the electricity. The operator in charge of the turbine room was told to go home—that his services were no longer needed, and at 6:00 o'clock, at the end of his shift, he was escorted to the refinery gate by the strikers. The strikers also entered the boiler house and drew the fires and told the engineers and firemen to get out.

Comments on Seizure

Of the seizure of the property the Board's decision says:

> "° ° ° It is clear from the Union's notice to Wood (Assistant Personnel Manager), and admitted at the hearing, that the purpose of the Union was to shut down the entire refinery in the most expeditious manner possible.
>
> "° ° ° After the closing of the various production departments, many of the strikers left the premises and went home. Others joined the picket line around the refinery. Still others, however, joined the group at the turbine plant which became the concentration point for the strikers. Eventually between 100 and 200 strikers jammed the turbine plant and the steps leading to it. ° ° °"

The decision recites the arrival of the county sheriff, and the refusal of the union president to order the strikers out unless the sheriff "had a court order". Though the sheriff was told by general counsel of the company that such an order was not necessary, the sheriff retired, after urging the strikers to quit.

Company officials and the loyal employes marched on the strikers and ordered them to get out, but it was not until late that evening that they acceded. The militia arrived two days later and kept the solid guard of strikers further away from the property, and also permitted the passage of food and other employes through the strikers.

Strikers Kept Food from Plant

The decision recites many illustrations of how the strikers' pickets kept employes and food from the plant. The decision cites similar illustrations as to the conduct of the strike in the field at the pipeline pumping stations—how strikers took physical possession of the stations and leases, closed and locked gate valves, and refused to give up their keys, and would not let other workmen, even when accompanied by deputy sheriffs, approach the property. Polish rods were dropped in the wells, thus making it more difficult to put them back into production. After some wells had been returned to production the strikers went back and closed them down again.

As to the act of seizure the decision said:

"The Union admits that the strikers seized control of the turbine plant and boiler houses, but contends that they did so only in order to shut the refinery down safely, a course of action justified by the volatile nature of the refinery's products. We find this contention to be irrelevant. For whatever purpose, the respondents' property was not theirs to seize.

Hold Strike 'Unlawful'

"Moreover, the contention assumes that the respondents themselves would not have been able to operate the refinery or to close it down safely. There is no credible evidence in the record to support this assumption . . . . We believe that if the respondents, instead of demanding possession of the turbine plant had done nothing, the strikers would have remained in the refinery indefinitely . . . . We believe it clear, and find, that the manner in which the Union conducted the strike on December 22 places it in that category of strikes declared by the United States Supreme Court in the *Fansteel* case to be unlawful. (*NLRB v. Fansteel Metallurgical Corporation*, 306 U.S. 240)."

As to the specific charges made by the union, the NLRB held it was plain that extra guards were hired only to protect the property of the company when strike was threatened. The board said:

"We find that the respondents hired extra guards without coercive intent and for the legitimate purpose of protecting their property in event of a strike, a protection all the more necessary because of the geographical extent of the refinery and the volatile nature of many of its products. We are confirmed in this opinion by the further fact that the record fails to disclose any anti-union activities on the part of any guards while in the respondents' employ."

Company Not Anti-Union

The board held there was no evidence showing where supervisory employes of the company had made statements against the union, the union statements to the contrary notwithstanding.

The board held that the strike was not caused by unfair labor practices, saying that "the union at no time claimed to represent a majority of employes within any appropriate unit."

One of the union president's statements of cause for the strike was the alleged failure of the company to pay wages comparable to those paid by others, but the board says this "does not constitute an unfair labor practice". The board finds that the company did bargain at great length with the union, but simply refused to grant the union's claims.

The union charged that the company had unfairly discharged members who participated in the strike. The board set out in detail the company's procedure in discharging some of the strikers—that two members of the company's legal department acted as judges before whom the company's superintendents and foremen presented evidence against each individual striker who was said to have violated the law in participating in the seizing of property or the forceful carrying on of the picketing. The two members of the company's legal department passed on the evidence in each case. When the men were fired they were informed that their union affiliation was not considered, and the board so held. Altogether 150 employes in the refinery and 99 in the field were thus fired.

Under the terms of the strike settlement a review by the company was to be granted for

(*Continued on page* 35)

NPN Reports

War Oil News and War Orders from

WASHINGTON

For ALL branches of the Oil Industry

WASHINGTON BUREAU, 1034-36-38 National Press Bldg. ● Telephone National 3477 ● A. M. PETTY, News Editor and Chief of Staff

Study Ruling on Father Draft

PAW Advises Filing of Supplementary Schedules to Cover Married Men With Children Not on Replacement Schedules Filed Prior to July 1

NPN Staff Special

WASHINGTON—Oil companies with Selective Service replacement schedules filed prior to July 1 (which did not list married men with children) should immediately file supplementary replacement schedules listing their employes who are between 18 and 37, inclusive, and are fathers of dependent children.

Such is the advice of PAW to oil companies, based on discussions with Selective Service headquarters here after announcement that the bars would be let down Oct. 1 on drafting of fathers where needed to fill a local draft board's quota.

Replacement schedules filed with state selective service directors prior to July 1 did not require the scheduling of 18-to-37 fathers for release. In replacement schedules filed after July 1 employers had to list fathers but not to schedule any for release prior to Oct. 1. Announcement Aug. 2 by War Manpower Chief McNutt that the ban on fathers would be lifted Oct. 1 left unsettled what would happen to fathers in cases where employers had filed replacement schedules prior to July 1. These replacement schedules remain in force for 6 months. Obviously, some of these replacement schedules will not run out until after Oct. 1, which means that fathers employed by these companies will have no protection against the draft subsequent to Oct. 1.

PAW Advises Oil Companies

So, PAW took up the matter with Selective Service officials. Result was that PAW is advising the filing of supplementary replacement schedules immediately by companies which had replacement schedules approved before July 1. In these supplementary schedules, however, PAW suggests that if an employe, who is a father, has any degree of skill at all he should not be listed for release before January, 1944. However, PAW urges that fathers who are common laborers or whose jobs require only 3 months training—or less—should be scheduled for release.

Accent on Job, Not Dependency

Decision to draft fathers beginning Oct. 1 emphasizes that henceforth the accent will be on occupation rather than dependency for every able-bodied male who has passed his 18th birthday but has not yet reached his 38th birthday.

To get an occupational deferment (other than farming) the draft registrant must be (1) in an essential industry (for oil that means the exploration, production, transportation or refining branches), (2) essential to the efficient function of that industry and (3) in an essential job that cannot be immediately filled by a woman or a draft-proof man.

Selective Service official told NPN that SSS has under consideration the issuance of a list of critical occupations in essential industries. This would not displace the occupation lists covered in activity and occupation bulletins, he explained. It would underline certain super-essential jobs in which there is a critical shortage of qualified men and for which relatively long training periods are required. It is understood that PAW has been working with War Manpower Commission on this new super-essential list to see that critical jobs in the oil industry are included.

Draft of Fathers Explained

The directive issued by Gen. Hershey to Selective Service local boards throughout the U.S. includes following provisions:

1—Fathers will be drafted only in such number as is absolutely required by a local board to meet a monthly call from the armed forces that cannot be filled from men, other than fathers, who are not eligible for occupational deferment;

2—Fathers will be called according to their selective service order numbers, without distinction regarding the number or ages of their dependent children;

3—Fathers who are "key men" in agriculture or essential industry will be deferred;

4—Fathers whose induction would cause extreme hardship and privation to their families will be deferred.

Prior to the directive issued Aug. 2, fathers with children born before Sept. 15, 1942, were deferred and not available for military service except for those who had transferred from essential agriculture to another activity without permission of their local boards, or were engaged in nondeferrable activity or occupation.

To Comb Files of Single Men

Local boards are instructed to comb the ranks of men who previously had been examined and deferred in 4-F as unfit for military service, and to sift out registrants who now may be qualified for duty. They were told likewise to give careful scrutiny to other deferred classifications, obtaining all other available manpower before ordering fathers to report for induction.

The decision as to the reclassification of each individual father will rest with the local board, subject to appeal. The record of these registrants will be reviewed in the order of their order numbers to determine their availability for military service. In making this determination the local board will give serious consideration to the contribution of the registrant to the war effort, either in industry or agriculture, and will decide whether he can be called without subjecting his family to extreme hardship and privation.

In making the decision as to extreme hardship and privation, local boards will take into consideration the Servicemen's Dependents Allowance Act of 1942, and other means by which the registrant could contribute to his family's support in event of induction. Under the Servicemen's Dependents Allowance Act, total allowances and allotments are as follows: wife, $50 monthly; wife and one child, $62 monthly; and an additional $10 monthly for each additional child.

Local boards will work gradually into the task of reconsidering the classification of fathers as the needs are ascertained. As of July 1, 1943, there were 6,559,000 registrants in class 3-A, the classification for men with children born prior to Sept. 15, 1942, and are not otherwise deferrable. Class 3-A will not be abolished and men will be reclassified out of it only as needed to meet the demands upon a local board for men for military service. Class 3-D also will be continued for men whose induction would result in extreme hardship and privation to a wife, child, or parent with whom they maintain a bona fide family relationship in their homes.

DEATHS

M. R. Singleton

M. R. Singleton, vice-president of Valvoline Oil Co., who headed the petroleum industry's scrap drive last year, died July 21 at Englewood (N. J.) hospital. He was 63.

S. L. Cronin

S. L. (Lon) Cronin, veteran oil man who headed Pure Oil Co.'s land division for many years, died in El Dorado, Ark., July 28 at the home of a son, Crawford L. Cronin. Best known as the man who opened the Van pool in Texas, Mr. Cronin retired in 1938 after 38 years service with Pure Oil.

George J. Kaestle

George J. Kaestle, 78, president of Forest City Oil Co., died July 26 at his home in Cleveland, Ohio. He organized Forest City Oil Co. in 1920 and was its president up to the time of his death.

Washington Outlook . . .

Only a Joke, Says Ickes, as Sarcasm Misses

By A. M. PETTY, NPN News Editor

"I was just having some fun," says Mr. Ickes, smiling ruefully, when asked about his New York speech recently which was widely interpreted as an attack on businessmen in the war agencies at Washington.

Among Mr. Ickes' own staff there were oil men who wondered if they had better resign, after reading newspaper accounts of their chief's speech. Reading the full text, however, convinced them that Mr. Ickes was speaking ironically, that he wasn't blaming industrialists like Knudsen, Nelson and Stettinius for the war program failing but rather praising their success.

But irony is a dangerous weapon for a speechmaker, especially when it is characteristic of a "curmudgeon" like Mr. Ickes to blast someone everytime he takes to the platform or radio. Lifted out of context, many of Mr. Ickes' remarks at New York lose their irony yet still make sense. Take for example, Mr. Ickes' remark about college professors in government:

"The first synonym for 'brains' is 'college professor', but who in the world would ever think of asking a college professor to formulate a sane opinion about the more serious affairs of government? It is notorious that college professors usually sit in their bathtubs with their hats on, or go to bed without taking off their shoes. Certainly, we shouldn't trust them to run the public's business."

That passage would have made newspaper headlines about "Ickes Attacks OPA's Professors" if there had not been even more juicy quotations further along in Mr. Ickes' speech. He said that if anyone believed what he saw and read, then he would conclude that the whole trouble with the war effort has been the New Dealer. Impression is that Washington has been overrun with New Dealers since Pearl Harbor. Yet the New Dealer is almost extinct, with Mr. Ickes one of the few surviving, he added.

Then came the paragraph which has been quoted so widely:

"It isn't the New Dealers who have been running the war. I challenge anyone to name names and fix responsibilities. If I know anything about Washington it is that the businessmen, who have been drafted, who have been running the war—men like Knudsen, Nelson, Stettinius, and many others I might mention. These are the men to whom the President has given vast powers. And while you are pondering this fact, consider also that many of the influential and busiest executives in this Administration were never New Dealers. Nor are they now."

Plain implication of this paragraph (the full paragraph was not quoted in most newspaper accounts) when read with rest of the speech is that Mr. Ickes doesn't believe the war effort is lagging, that credit for it not lagging is due to the businessmen "imported" into Washington. Yet his left-handed approach made it appear that he was blaming them for it lagging.

* * *

In the very next paragraph, Mr. Ickes speaks pridefully of PAW's accomplishments and attributes them to government-industry co-operation and his staff made up of oil men.

"But I am a New Dealer," Mr. Ickes' speech continued after the paragraph quoted above. "Shamelessly, I make no bones about it, I was a New Dealer when I operated the Public Works Administration and when I was responsible for many billions of tax dollars. Does anyone here recall any scandal arising out of that particular deal? And then when the war started, the President made me the Petroleum Administrator. Now I didn't proceed to beat the petroleum industry to its knees, nor did I try to nationalize it. On the contrary, I built up a government-industry cooperative, which has done one of the best, if not *the* best, job in Washington.

"As Petroleum Administrator I set up a technical administrative organization in Washington. I have never heard it disputed that we have a better petroleum staff than any oil company in the world. And when these men were employed not one was asked what his politics were. All that we were interested in were his qualifications and his capacity to do a first-class job under abnormal conditions. If I were urged to make a guess I would venture that probably 90% of my petroleum staff customarily vote the Republican ticket. I ask you—is this sort of new dealism helping or hurting the war?"

* * *

Oil distribution manpower situation must be in good shape—judging by the lack of applications to PAW for a declaration of "essentiality" on a locally-needed basis (which assures marketers in an area of protection against raids on their personnel by war plants and help in recruiting replacements for men lost in the draft).

It may be that some marketers believe, like a group in California, that compliance with PAW Directive 68 (joint use of bulk plants) and ODT General Order 37 (local deliveries) is too high a "price" to pay for a declaration of "essentiality" from the War Manpower Commission.

If so, it should be pointed out that the alternative proposal to WMC by another government agency (not ODT) was far stricter than PAW 68 or ODT 37. This suggestion was that no oil distributor be allowed to come within the declaration of essentiality unless he agreed to accept a number of conditions, including release of all his salesmen. Another provision was that in cities over 500,000 population there should be a pooling of bulk plant operations—closing some, if necessary—so that no bulk plant had a monthly throughput of less than 1,500,000 gal. No service station or commercial account could receive deliveries oftener than once every 7 days (14 days in small towns). No truck smaller than 1500 gal. could be used (smaller trucks could be used in small towns). Every truck would have to average 4 loads daily (3½ loads in rural areas and small towns).

PAW, with the help of ODT, talked WMC into rejecting this drastic proposal in favor of compliance with PAW 68 and ODT 37 which are much less stringent than the provisions outlined above (See NPN, July 14, p. 9 for outline of PAW's "locally-needed" program).

Bar Further 'Raiding' Of Oil Workers In Essential Class

NPN Staff Special

WASHINGTON—If the employe of any company engaged in the exploration, production, refining or transportation branches of the oil industry has received a letter from a County War Board "threatening" him with military service unless he enters agricultural employment, Fred H. Harbison, PAW's labor counselor, wants to hear about it. (Since employes in oil marketing are not regarded as in an "essential" occupation, they are legal prey for such letters, if they have previous experience in farm work.)

Taking the matter up with the War Food Administration, he obtained a promise that there would be no further "raids" on exploration, production, refining and transportation branches — that is, the "essential" branches of the industry.

Following is text of a memorandum sent out by the food administration to all state war board chairmen on "recruitment of workers for farms from essential nonfarm industries."

"It has come to our attention that some county USDA War Boards, in carrying out the provisions of the Secretary's Memo No. 975-53, of March 5, 1943 and War Board Memorandum 287, dated April 1, 1943, have sent letters to persons who are now engaged in essential nonfarm industries, in an effort to induce them to return to the farm.

"The State War Boards were definitely directed by these memoranda that persons to be contacted should be those who are not now engaged in any type of farming activity and who are not now engaged in any other type of activity that has been designated as essential to the war effort.

"We are confident you will continue to help get experienced farm workers now engaged in *non-essential* occupations to return to essential farm work.

"However, persons who are now engaged

in critical occupations in other essential industries should not be requested to leave such occupations to return to farming.

"It is the further responsibility of the War Boards to report to the Selective Service local boards the names and addresses of all persons who are now deferred for agricultural reasons but who have left their farm jobs to accept employment in nonfarm occupations. However, in reporting such cases, recommendation should not be made as to the class in which it is believed the individual concerned should be placed. The Selective Service local boards have complete responsibility to determine the classification of such persons."

Jeffers' Tire Warning Spurs Campaign To 'Save Carcass'

WASHINGTON — Details of the "Save the Carcass—Keep the Customer" campaign of the Petroleum Industry War Council, emphasizing to oil marketers the vital necessity of urging motorists to recap their tires before it is too late, are now being distributed throughout the oil industry, William R. Boyd, Jr., PIWC chairman, has announced.

The campaign will be directed both to motorists and service station dealers, but the primary emphasis will be placed on the dealer campaign.

Rubber Director Jeffers' warning that the tire situation is getting worse instead of better, and that no non-essential drivers can expect to get any new tires for at least the next 12 months, is serious," Mr. Boyd said. "It is the patriotic duty of the oil industry, as well as good business, to do everything it can to prevent millions of cars from being forced off the roads.

Danger From Negligence

"A-card drivers, and possibly many others, assured by Mr. Jeffers that they can expect to get not even one new replacement tire for a year or more, have obviously got to keep on using for some time the tires they now have. That will be impossible for many of them, we believe, unless they watch their tires carefully, and have them recapped before it is too late. A tire that wears beyond the recapping point may mean a car laid up.

"The oil industry has been cooperating for many months in the government's rubber conservation campaign to have motorists keep their speed down to 35 miles an hour, and to keep their tire pressures at 32 pounds. Now we are asking the service station dealers to watch their customers' tires closely, and to warn them to recap as the only way to keep rolling."

Dealers will be advised of the urgent necessity for this action, and of the things that should be done, by advertising in oil industry trade papers, by stories in company publications, and directly through the sales departments of the supplying oil companies.

Companies to Finance Drive

There will be no direct advertising to consumers by the council, but all companies are being asked to incorporate the consumer slogan—"Save the Carcass—Recap and Roll"—in their own regular advertising. The campaign also contemplates the publication of booklets, posters, and other point-of-sale advertising material directed to consumers, to be used and distributed by service station dealers.

A brochure describing the campaign in detail has been issued, and is now being distributed to oil companies throughout the country.

The campaign is being conducted by PIWC's subcommittee on product conservation, of which B. I. Graves, vice-president of Tide Water Associated Oil Co., 17 Battery Place, New York, is chairman.

The small budget necessary to finance the campaign will not be taken from council funds, but will be contributed directly by those companies which participate in the drive. Since the plan includes no consumer advertising, other than the preparation of booklets, posters, etc., it is expected that the total cost will be nominal.

The complete details are being sent directly to oil companies, but further information may be obtained from the subcommittee's district advertising representatives: District 1, H. F. Brown, Shell Oil Co., Inc., New York; District 2, Wesley I. Nunn, Standard Oil Co. (Indiana), Chicago; District 3, George C. Gibbons, Texas Mid-Continent Oil & Gas Assn., Dallas; District 4, George B. Cramer, The Powerine Co., Denver; and District 5, John H. Weiser, Gilmore Oil Co., Los Angeles.

Col. Dewey Optimistic On Tire Outlook

WASHINGTON—Deputy Rubber Director Bradley Dewey told NPN Aug. 2 that the stockpile of crude rubber is "adequate for all essential military and civilian tire uses" and made it clear that he included heavy duty truck tires.

Col. Dewey scoffed at reports that heavy duty truck tires made partly of synthetic rubber were not holding up. He laid reported difficulties to drivers who expect pre-Pearl Harbor quality and load trucks above manufacturers' specifications and exceed speed limits.

Truck tires from synthetic rubber, Col. Dewey said, are 3 times better than those made a few months ago. Each week sees a little more uniformity in the synthetic rubber manufactured, he said.

Great progress has been made in processing the rubber into tires, Col. Dewey explained, but he emphasized that truckers must keep down to reasonable speeds and not overload the trucks.

He said he hoped to get truck tires that compare with "old standards" but that this could not be done "right away."

Col. Dewey said his office had figures on performance of synthetic rubber truck tires but declined to make them public. Improvements are coming along so fast, he said, that figures would be stale before they could be printed.

17% Less Gasoline Used By Motorists in '42

WASHINGTON—American automobile users consumed nearly 20 billion gallons of gasoline during 1942, a drop of 17% under 1941, according to records compiled by the Public Roads Administration.

The 1942 total on which gasoline taxes were levied was 4 billion gal. less than in the preceding year. Total state gas-tax collections, plus receipts such as inspection fees, dealer's license fees, fines and penalties aggregated $854,803,000 for 1942, compared with $958,013,000 in 1941.

Taxes on aviation gasoline—$948,000 in 1942 and $701,000 in 1941—are included, but refunds for non-highway use amounting to $63,264,000 in 1942 and $57,214,000 in 1941, are excluded from total receipts.

The average gasoline tax per gal. for all states, PRA reported, was 3.99c in 1942, the same as for the previous year. Rates of state taxes ranged from 2c to 7c per gal.

The greatest decline in gasoline consumption, based on amount taxed, was reported by New Hampshire, with 31% fewer gallons in 1942 than in 1941. Eastern seaboard states where gasoline rationing began May 15, 1942, reported drops of 17 to 31% for the year.

In the area rationed beginning in December, 1942, Missouri, Montana, New Mexico, Oklahoma, and Wyoming also had reductions of 18% or more.

SOFTEN MID-WEST FOR CUT

(*Continued from p. 3*)

and coupon values to fit PAW's certifications.

OPA would like to extend gasoline rationing equalization to the entire country. (So did PAW, but the Petroleum Industry War Council wouldn't go along.) Since PAW isn't ready to say that inventories in Districts 4 and 5 are at a point where rationing should be cut, OPA might act on its own and reduce gasoline ration values to bring annual average mileage down to 5000 throughout the U. S. on the grounds that this step is necessary to conserve automobiles and tires.

There is growing opinion that OPA will not equalize rations throughout Districts 1, 2 and 3 on the same day that PAW's certifications become effective. Also, some OPAers who probably want to make PAW sweat a bit, say that the "pleasure driving" ban should not be lifted until PAW has assured a steady supply of gasoline for District 1.

Ultimately, OPA's objective is believed to be 3-gal. value for "B" and "C" coupons in all three districts and 2-gal. value for "A" coupons—with no occupational driving included. But, for mechanical reasons, OPA may have to cut the "A" coupon in Districts 2 and 3 to 3 gal. on Sept. 22 by extending the validity period for one month, making it good for three months instead of two.

WAR ORDERS *for the* OIL INDUSTRY

NPN will appreciate hearing from its readers if they feel any pertinent regulations have been omitted from this page.

Copies of the complete text of the following orders can be obtained from PLATT'S OIL-Law-GRAM, 1213 W. Third St., Cleveland, Ohio.

Minimum charge for single copies, $1, postage paid. One year's service, $75.

Code: AO—Administrative Order; CMP—Controlled Materials Plan; D—Directive; FDO—Food Distribution Order; GMPR—General Maximum Price Regulation; GO—General Order; I—Interpretation; L—Limitation Order; M—Conservation Order; MPR—Maximum Price Regulation; P—Preference Rating Order; PAO—Petroleum Administrative Order; PR—Priorities Regulation; PrR—Procedural Regulation; PS—Price Schedule; RO—Ration Order; RPS—Revised Price Schedule; SO—Supplementary Order; SR—Supplementary Regulation.

The Week's Orders

(Issued from July 24-31 inclusive)

PR—Prices
- 79—Carbon tetrachloride
- 88—Gasoline, Am. 119
- 121—Petroleum coke, Am. 21
- 131—Camelback, Am. 4
- 136—Trucks, Am. 96
- 165—Fuel oil, Supp. Serv. Reg. 7, Am. 1
- GMPR—Contract carriers, SR 15, Order 85

RO—Ration Orders
- 1A—Tires, Am. 42, 43
- 5C—Gasoline, Am. 70
- 9—Stoves, Am. 7

M Orders
- M-150—Aromatic petroleum solvents

R Orders
- R-1—Rubber, Am. 2

WPB—War Production Board
- Cert. 103—Butadiene
- Cert. 104—Buna rubber

ODT—Office of Defense Transportation
- GO 7—Tank cars, Spec. Direction 1

Digest of Week's War-Oil Orders

OPA—Office of Price Administration

CAMELBACK—MPR 131, Am. 4—Manufacturer's ceilings for all types of camelback—natural, reclaimed or synthetic rubber—equalized; prices per lb. are 28c for Grade A, 23c for Grade C and 18c for Grade F; issued 7/27, effective 8/2.

CARBON TETRACHLORIDE—MPR 79—Previous price schedule on carbon tetrachloride (RPS 79) revised to abolish distributors' delivered price ceilings established for western states; new ceilings are set f.o.b. shipping point and permit transportation allowances for sales to consumers located at great distances from warehouse centers; formula also set up for pricing mixtures with petroleum fractions; issued 7/30, effective 8/5.

FUEL OIL—MPR 165, Supp. Service Reg. 7, Am. 1—Price increase of .3c for tank wagon commission sellers of fuel oil made retroactive to beginning of rationing; increase is therefore effective in East and Midwest on Dec. 29, 1942, in Oregon and Washington on March 16, 1943, and in Idaho on April 2, 1943; issued 7/29, effective 8/4.

GASOLINE PRICES—RPS 88, Am. 119—Ceiling for tank wagon deliveries in New Jersey, Pennsylvania, Delaware, Maryland, Virginia and District of Columbia in single lots of 250 gal. or over for purchasers of 10,000 to 60,000 gal. (semi-annually) raised ½c; former price set by Am. 117 was ½c per gal. below commercial consumer's tank wagon price; new ceiling levels all prices up to 60,000 gal. by setting them at reference seller's tank wagon price; new ceiling is temporary one while OPA re-examines customary price practices in area; issued and effective 7/30.

GASOLINE RATIONING—RO 5C, Am. 70—Defense workers who quit jobs may turn over unused supplemental rations to plant transportation committee as well as to local board; issued 7/26, effective 7/31.

PETROLEUM COKE—MPR 121, Am. 21—Price order amended to include coke only when sold by a distributor for use as fuel; issued 7/24, effective 7/12.

STOVES—RO 9, Am. 7—Certificates for heating stoves expire after Aug. 23, 1943; issued 7/29, effective 8/4.

TIRE RATIONING—RO 1A, Am. 42—Forms for allotments of tires, tubes, recapping service and camelback simplified so that OPA Form R-2 (Revised) may be used for each; issued 7/23, effective 7/29.*

RO 1A, Am. 43—Special OPA tire examiners will be assigned to rationing boards and boards will then be classified as Truck Tire Boards with power to act on applications for trucks normally stationed within area or temporarily located there; boards will be unable to act when tires or tubes are leased under mileage contracts, however; issued 7/23, effective 7/29.

*Not released on date of issuance.

TRUCKS—MPR 136 as amended, Am. 96—All new trucks, busses and commercial trailers produced under recent WPB authorization to resume limited production placed under price control of MPR 136; ceilings set by formula reflecting March 31, 1942 levels; trucks in ration stockpile remain under GMPR, with additions to maximum permitted for storage and maintenance; issued 7/29, effective 8/12.

GMPR, SR 15, Order 85—Petroleum Transport, Inc., Lansing Mich. permitted to increase contract carrier service rates to Gulf Refining Co., Pittsburgh; issued 7/29, effective 1/1/43.

WPB—War Production Board

BUTADIENE—WPB Cert. 103—Plan approved for cooperative action in construction and operation of plant facilities for production of 100,000 short tons of butadiene annually for sale to Rubber Reserve, by Neches Butane Products Co., Atlantic Refining Co., Socony-Vacuum Oil Co., Inc., The Pure Oil Co., The Texas Co. and Gulf Oil Corp.; signed 7/28.

RUBBER—R-1, Am. 2—Purchase orders of resellers of tires and tubes originating outside continental limits of U. S. are not required to have inventory certification; issued and effective 7/28.

RUBBER, BUNA—Cert. 104—Approval given to standard form of agreement proposed by Rubber Director and Secretary of Commerce for execution between Rubber Reserve and private corporations for cross-licensing of patent rights applying to manufacture of Buna rubber; signed 7/28.

SOLVENTS, AROMATIC PETROLEUM—M-150 as amended July 28—High-flash naphtha included under allocation control of order; small order exemption for all such solvents (other than high-flash naphtha) increased from 60 to 550 gal. per month, provided solvents are used for wide range of special listed purposes; issued and effective 7/28.

ODT—Office of Defense Transportation

TANK CARS—GO 7, Special Direction 1—Revised list issued of commodities which may be shipped in tank cars; no changes made for petroleum products; issued and effective 7/24.

Court Rules War Sales Ban Not Cause For Breaking Lease

NPN News Bureau

NEW YORK—Court of Appeals, New York State's highest tribunal, recently has established the rule that an automobile dealer cannot terminate his lease because of wartime restrictions on car sales. The case apparently defines the law as it applies to all retail merchants operating under WPB and OPA regulations, including gasoline station operators.

While previous rulings affecting oil and gasoline dealers (such as the Colonial Beacon Oil Co. case) also denied the right of station operators to void leases because of the impact of war conditions on their business, this is the first time that the Court of Appeals has passed on the principle involved.

Leases often may be cancelled where the operation of a business becomes prohibited by a governmental agency, but the court now holds that if a number of different business operations are carried on at the leased premises, and only some of the original purposes of the business have been made illegal, the tenant must continue to pay rent. Stations run in connection with garages come most conspicuously under this classification.

Since no opinion accompanies the decision, no rule of law is specified, but it is considered possible that a future case might show that where most of a tenant's business has been wiped out by law, the court might allow cancellation of the lease even though certain phases of the business still could be carried on.

The opinion of the Appellate Division of the New York Supreme Court when the current case was before it was:

"There can be no doubt about the proposition that where a lease restricts and limits the use of premises let to a particular specified purpose and thereafter, because of the enactment of valid governmental statutes, decrees or regulations such use becomes unlawful, the subject matter of the contract is destroyed and the covenants of such lease will not be enforced against either party thereto. The rule is that where the lease is exclusive the subsequent passage of prohibitory laws terminates it."

Ruling Upholds Lower Court

But the Appellate Division said that the property in this case had been leased for the sale of automobiles, parts and accessories, and that both tenant and landlord had expected a large volume of servicing work would be done. Therefore, the court argued, "A change in the law during the term of the lease which merely restricts but does not wholly prohibit the conduct of the business carried on does not release the tenant from his obligation to pay rent." That decision the Court of Appeals upheld.

Many gasoline stations have been closed throughout New York State under government restriction. The full impact of such wartime curbs has never been fully surveyed here, but plans for such study have been mapped by—among other groups—the Empire State Petroleum Assn., Inc., according to its secretary Harry B. Hilts.

OPA Charges Dornoil Products With Ceiling Violations

Special to NPN

NEWARK, N. J.—Suit to recover $56,827—3 times the amount of the alleged charges over the ceiling in the sale of a million gal. of petroleum products—has been filed in federal court here by OPA against Dornoil Products Co., Inc., of Newark. Injunction also was asked restraining the company from further alleged violations and the hearing was set for Aug. 23. The complaint charges Dornoil, between Aug. 1, 1942 and Dec. 1, 1942, sold 4,969,642 gal. of fuel oil, 599,851 gal. of kerosine, and 15,560 gal. of gasoline for which it charged $18,942 above the ceiling price.

The EDITOR'S Page

Readers comments and opinions will be much appreciated by—WARREN C. PLATT, NPN's Editor and Publisher, Penton Building, Cleveland, O.

What OPA Tried to Hide from the Industry In Its Fuel Oil Advisory Panel Meeting

THE secret meeting of OPA's fuel oil advisory panel at Washington July 20 and 21 only goes to prove the crime against American rules of fair play and the injustice to those in the oil industry who are governed under the rules thus secretly devised.

For two days this panel discussed matters of the most vital importance, not only to every fuel oil distributor, but to every oil man and yet, by decree of Chairman Dean and his associates, the meeting was secret, and nobody but the chosen few present were to know anything of what transpired.

Fortunately for the oil industry, more and more men who are members of these secret panels and who attend these secret meetings, are learning that they have rights as American citizens and responsibilities to the whole oil industry whom they represent, and that the only way to exercise those rights and to discharge those responsibilities, is to tell their fellow oil men what goes on in these secret meetings.

Consequently, Dr. Dean's fuel oil advisory meeting is not as secret to the oil industry as he would have it.

In opening the secret meeting Dr. Dean denied that the meeting had been called because of any criticisms by NPN or anyone else, and asserted that it was not necessary to have an open meeting as NPN had urged. Then came two days of discussion which should have been before the whole oil industry.

NPN summarized this discussion quite thoroughly in last week's issue but here are some points that can be added to that report:

OPA officials told the meeting that, as of May 31, out of 3500 suppliers of fuel oil, 266 had never sent in any report, 249 had sent in reports but with no certificates, and 215 had made reports but had not sent in sufficient certificates.

On May 1, 60 of the largest primary suppliers owed, on the basis of sales, 5,559,000,000 gal., but as of the day of the meeting, these 60 had reported on 5,290,000,000 gal., leaving a shortage of only 269,000,000 gal.

Thirteen of the 60 are still not in balance, but are expected to approach balance within the next 35 to 45 days, or to have logical explanations.

"Just tell your friend OPA why you are not in balance, and they will help you," is the paraphrase of a statement of an OPA officer, which is vigorously disputed by some of the companies who are now "being prosecuted". These claim that for months they have been trying to tell OPA their troubles in handling the multitude of coupons.

Shad Pollier, head of the enforcement section for fuels and consumers' goods of OPA, tried to explain their so-called enforcement system, very evidently to answer the points made in recent issues of NPN against OPA's "kangaroo courts". But never once did Mr. Pollier explain either the necessity or the good law of these "kangaroo courts" displacing the legally constituted courts.

In the discussion, some of the oil men got Dr. Dean to say that OPA, in applying suspension orders, had to consider the effect of such suspension orders on the public—to wit, they could not suspend companies whose distribution was of such size that no substitute could easily be found for that distributor and thus avoid imposing hardship upon a large number of fuel oil consumers.

Dr. Dean evidently did not like the place that discussion put him in, which was that the larger the company, the more customers it had, the less it had to fear OPA suspension orders.

When proposal was made to enlarge the panel, to bring in presidents of some of the interested oil distributing associations, Dr. Dean objected, stating that he did not want to make the panel "extremely unwieldy", and "turn it into a town hall meeting", and he did not want a "pressure group" within the panel.

Even when it was pointed out that the average small fuel oil man had no direct representation on the panel, the OPA men insisted that the panel be kept in its present form.

The strength of any cooperative effort between government and industry rests upon the extent to which that cooperation includes the industry, and representatives of the industry's own choosing; and also depends upon the extent to which the recommendations of such a joint democratic body are followed.

In the case of OPA, the fuel oil panel represents largely the major oil companies who are the farthest removed from the detail of handling fuel oil coupons. But even then the advice of the panel members has been sought only a few times. So far as is known, only a few of the panel members from the oil industry who happen, incidentally, to represent associations, have made any effort to consult with the oil industry or to inform the industry as to what is going on in the secrecy of the panel.

An effort was made to get a vote on whether membership in the panel should be enlarged. Chairman Dean finally denied the meeting the opportunity of voting, declaring that the meeting was not operating under parliamentary rules and that he did not feel a vote was necessary. If this panel is not allowed even to canvass those present for an expression of opinion, by means of a vote, certainly the panel cannot be said to be a part of American democracy.

Jobbers Who Want Wider Margins Should Answer Those Questionnaires

THE opportunity is now before the independent oil jobbers of the country to prove their need for wider margins. This opportunity lies within the jobbers who have been selected as typical by filling out the questionnaire on costs sent out by PAW.

The questionnaires are simple. For samples of them and detailed explanation see pages 34 and 38 NPN for July 14th. They will not take much time to fill out, as they call for the figures that every jobber should have handy in his books.

Already some jobbers to whom the questionnaires have been sent, have protested that they did not have manpower enough to fill in the answers. There is no question but what all oil jobbers are short-handed. But according to all reports, oil jobbers' margins are also short, and profits are missing entirely. So, if the oil jobbers wish more margin in order to keep out of the red, it will be necessary for them to take the time to make out these questionnaires.

Only a limited number of jobbers, typical of all, have been asked by PAW to fill out these blanks. However, any other jobber who wants to give the information can, and that information will be considered.

The jobbers' associations could properly ask PAW the names of the jobbers in their states to whom questionnaires have been sent, to the end that the associations could offer their assistance to these jobbers in preparing the replies, and also to the end that the state association might select some firm of certified public accountants, who would keep the information confidential, to receive copies of these replies from the territory covered by the association, so that they could be analyzed by the accountants.

If the jobbers' figures fail to show any need for a wider margin the case is ended, but if those figures do show such a need, the getting of a wider margin still remains something of problem, because any wider margin would mean a larger price from the consumer, which the administration seems loath to authorize. At all events the jobber's opportunity for a day in court is here, if he fills in these questionnaires.

Oil Must Protect Itself with Facts As Rumors Grow from the Oil Shortage

ANY reduction in the value of "A" gasoline coupons over the Mid-West and the Pacific coast, no matter how necessary from the standpoint of shortage of supply and growth of military demand, will strike so deeply into the personal living habits of every family that, in all probability, there will be serious criticism of the oil industry. That there should be such criticism may seem strange to many oil men, who believe that all the reasons for our shortage in petroleum supplies have been made known to everyone.

But, according to voluntary comment from the general public, this does not seem to be the case. Explanations made so far seem largely to have confused the average gasoline consumer. Chairman Boyd of PIWC has appointed a committee to study oil supply, but if in a few days rations of "A" cards, particularly, are cut, the committee will not have time to report.

In the long run, perhaps, it would be better for individual oil companies to tell their story in their own language from their own point of view, as to why they haven't got enough gasoline to go around, as to the difficulties they have met in getting supplies, and fitting in their story with whatever statement may come from PAW and OPA.

The oil industry is in an unfortunate position because of the following facts:

(1) The New Deal and OPA have fumbled gasoline rationing miserably right from the start, despite excellent cooperation from oil men.

(2) Gasoline rationing was started because of a rubber shortage due, at least in part, to New Deal fumbling. Now, after assurances of plenty of synthetic rubber, it looks as if we were going back to keeping restrictions on gasoline because of the rubber shortage.

(3) The New Deal's military authorities have not cooperated well with the oil industry, either in estimating with any degree of accuracy their requirements of oil products, or in procuring those products. The military authorities have misjudged their oil requirements, and have so handled their procuring of oil in secret from the oil companies that they have provoked unexpected shortages in the East and in the Southwest. The severity of these shortages could have been reduced had the military authorities told the industry a little of their plans.

(4) The oil industry has told the world for years that it had plenty of both production and reserves. Now, while the industry has large reserves, the New Deal has not permitted it to drill for current production sufficiently to meet today's war demands.

(5) As a higher price for crude is needed to get more oil to take care of today's deficits, the oil industry finds itself up against the "hold-the-line" policy of the New Deal of refusing to approve any advance in oil prices on the plea that such advances would mean "inflation".

(6) And last, "Candidate Roosevelt," as oilman Alf Landon called him on the radio the other night, who has never shown any particular fondness for the oil industry, can quite probably be expected to so handle the explanations and the circumstances of this oil shortage and any possible advance in price or the paying of any subsidy, so as to keep the public from realizing that this serious shortage is due to New Deal planning and New Deal bungling. In some way, probably, the blame will be put on the oil industry.

Had the New Deal kept its mind and efforts focussed on getting sufficient petroleum supplies for the military forces and the essential needs of the country, rather than on proving economic price theories, there is little question but what we would have sufficient petroleum for all reasonable purposes, and at an advance in price of not to exceed a couple of cents a gallon. As consumption would have been restricted anyway on account of rubber conservation, and because no more than reasonably essential driving should be done, these few cents a gallon would have amounted to but $5 or $10 a year per car, at the most, depending upon the severity of the restrictions because of the rubber situation, and on the East Coast because of the submarine blockade.

° ° °

A CLEVELAND attorney with considerable corporation practice, and trustee of a fine small college, stopped one of our men on the street the other day—a man he had known for years—and inquired about the gasoline situation. After NPN's man had given the facts the attorney remarked:

"The day is coming when the oil companies are going to have to settle with the public for these things."

In other words, this sample of the average American citizen, with strong personal sentiments for capitalism and all that, just did not believe the facts were as represented.

To many of the oil men who have been active on the various committees, the facts may seem clear and convincing. But it would be far safer for the industry if every oil man, and particularly those in the major companies, assumed that the facts are not clear or convincing as presented to date, and that, unless the mind of the public is changed, "these oil companies are going to have to settle with the public for these things", "these things" being great interference with the personal living of the average motorist the necessity for which the motorist has not yet been convinced.

PAW Ickes can do much by immediate, clear statement of the facts. But, to make the public believe these facts, it will be necessary for the individual oil companies and the individual oil men to reiterate them time and again to their own customers.

These facts, as they must be told, will not be complimentary or pleasing to the New Deal in the forthcoming presidential campaign. Distributing those facts, therefore, will get the companies into politics, so to speak, because unquestionably those interested in continuing the fourth-term candidate in power will do their best to put the blame, however they may figure it out, on the oil industry and the big oil companies for this oil shortage and any necessary advance in the price of oil, rather than to let the voters believe that this oil difficulty has come about due to bungling New Deal shortsightedness and New Deal incompetence.

Demands OPA Quit Prejudicing Public by False Press Stories

OPA's practice of issuing press releases with biased and even false statements in connection with its prosecution of oil companies before those oil companies can even find out what the charges are, is vigorously criticized by Clyde G. Morrill, executive director, Independent Oil Men's Assn. of New England, in a protest, filed July 29 with the Boston office of OPA.

Mr. Morrill's protest was against the OPA press story of charges brought against the State Fuel Co., of East Boston. This press release was issued to the newspapers in Boston and was put on the air July 24, ten days before a hearing was to be held.

"I most emphatically protest such releases," wrote Mr. Morrill to OPA, "because I feel they are prejudicial to the interests of such companies as may be affected. The judicial nature of these proceedings would certainly require that no releases of any kind take place before the hearings.

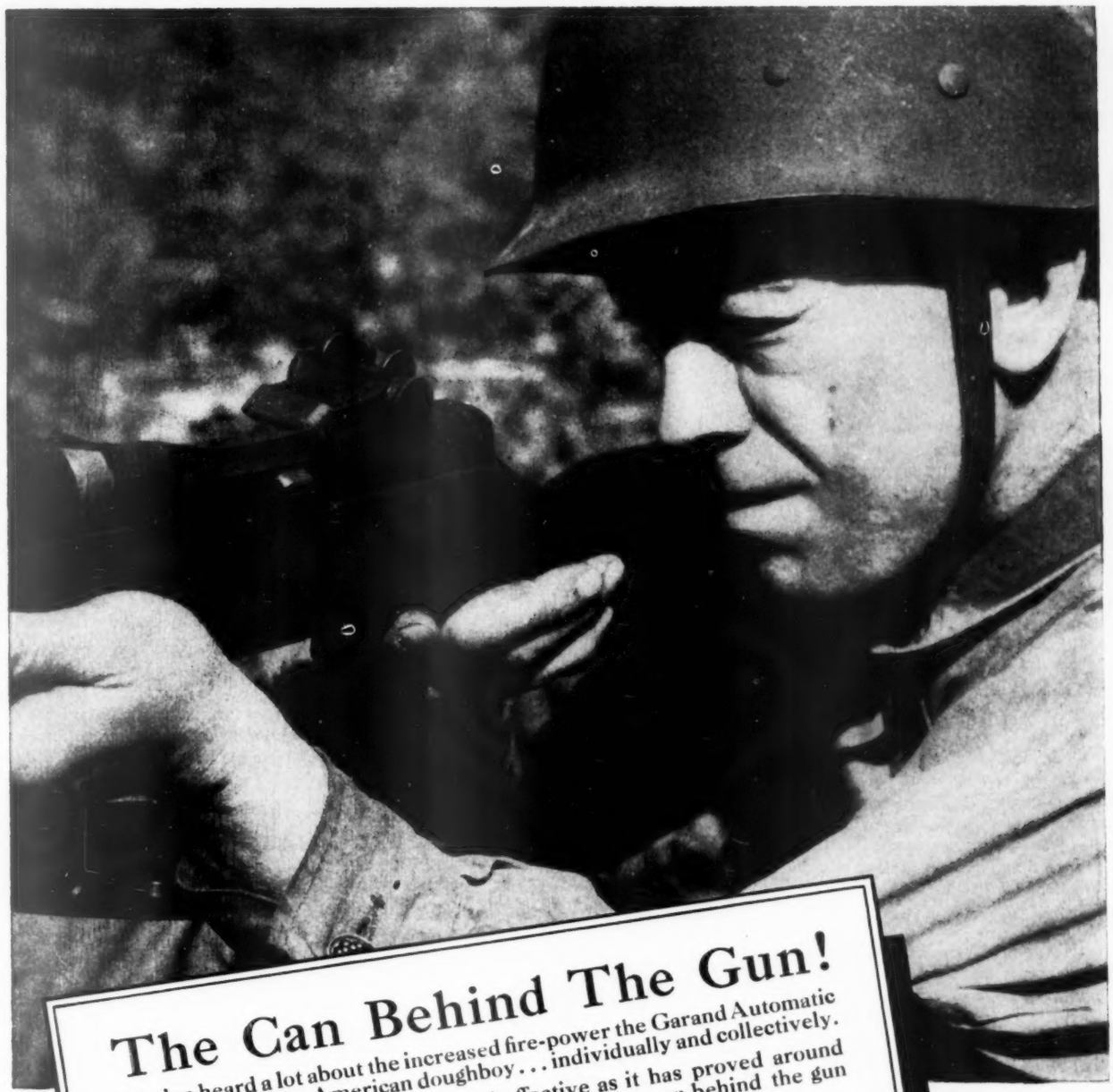
"In this particular case the writer of the release was not even careful about his facts, for in the third paragraph it is stated that 'the State Fuel Co., as a primary supplier of oil, can secure unlimited quantities of oil.' To my certain knowledge, this company last year was constantly before PAW endeavoring to get amounts of oil that would come somewhere nearly approaching their usual quota. They never did receive it.

"This news release would indicate that with the filing of charges against the State Fuel Co., OPA could rest secure that the hearing officer would render a decision that they were guilty and assess a penalty, going so far as to state in the last paragraph that 'plans would be taken to assure that the firm's customers might be served by other suppliers.'

In issuing such releases OPA, despite all of its alleged skill in the law, has violated one of the fundamentals of the law. That fundamental is that every man is entitled to his day in court, and to have his case presented fairly to judge and jury, and through the newspapers to the public. However, the present administration, including the anti-trust division of the Department of Justice, has been quite prone of late years to try its cases in the newspapers, and it has not always stuck to the truth in these newspaper trials.

All of this is a part of the inherent unfairness, unconstitutionality, and un-Americanism which NPN has been pointing out as existing in the OPA kangaroo extra-judicial court system which OPA has been setting up in complete disregard of the established courts, as provided in the Constitution and in the statutes of Congress and the various states.

If OPA were as willing to consult as frankly and openly with the whole oil industry, with no secret meetings whatever, as it is to take its one-sided views of its so-called "cases" before the people before trial, OPA would not have the trouble with its regulations that it has.



The Can Behind The Gun!

You've heard a lot about the increased fire-power the Garand Automatic Rifle has given the American doughboy . . . individually and collectively.

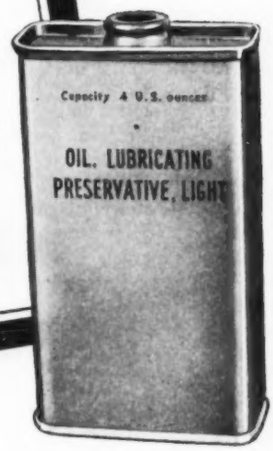
But excellent as the Garand is and effective as it has proved around the world for the man behind the gun . . . it's the *can* behind the gun that keeps it in fighting trim.

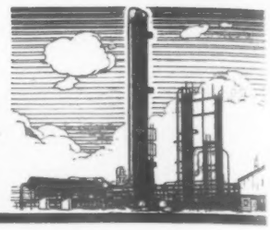
And that's the compact can of Light, Lubricating, Preservative Oil issued by the Army to prevent rusting of the action when the rifle is not in action.

At Crown we are more than a little proud that much of this lubricating oil is packed in Crown Cans . . . and that the can behind the gun so frequently comes from our production lines.

CROWN CAN COMPANY, PHILADELPHIA • NEW YORK
Division of Crown Cork and Seal Company • Baltimore, Maryland

★ ★ CROWN CAN





Lift Curbs on Gulf Refineries

PAW Acts to Increase Output Following Hurricane Which Damaged Several Refineries. Some Great Lakes Area Refineries Get 'Go Signal'

NPN News Bureau

WASHINGTON — The hurricane which raged through the Gulf Coast last week forced PAW to lift all previous directions relative to total inputs for refineries in the area. Previously, on July 24, PAW had given Southwestern refineries a green light on crude runs in an effort to spurt production of gasoline and home-heating fuel oils for Mid-west and East Coast consumers.

In telegrams of July 24, PAW established crude run allowables for District 3 at 1,410,000 b/d—the same as July—for oil obtained from usual sources, and at the same time permitted a "ceiling unlimited" run of all additional crude that refiners themselves could obtain from West Texas, New Mexico, or Southwest Texas fields.

Incomplete reports of the hurricane, however, which struck on July 27, forced PAW to telegraph all Gulf Coast plants to increase crude runs to the maximum rate physically possible to provide products as replacements for those not produced due to shutdowns. They were directed immediately, or as soon as possible, to increase throughputs regardless of any previous directions.

Wants Home-Heating Oils

August crude run quotas for midwestern refineries have been set at 1,128,000 b/d, the same as July. PAW has urged all District 3 refiners to increase their output of home-heating oils and to maintain this increased production until the end of the coming heating season.

At the same time, 11 refineries adjacent to Great Lakes' ports were given the go sign to increase their crude runs, provided the petroleum products made from the processing of the additional crude are earmarked for eastward shipment.

The 11 Great Lakes plants were authorized to exceed August quotas under the following conditions: (1) The refiners will continue to supply crude oil or petroleum products to their usual outlets in the Mid-West; (2) the additional crude that is run must come from the refiners' own inventory or from another controlled inventory, provided it does not interfere with normal supply arrangements; (3) the principal petroleum products obtained from the additional crude runs must be shipped into the East Coast area and cannot be distributed in the Mid-West.

The 11 Great Lakes refineries were listed by PAW as follows: Sinclair, Socony-Vacuum, and Cities Service, all in East Chicago; Socony-Vacuum in Trenton, Mich.; Sun Oil, Sohio, and Gulf, all in Toledo; Indiana Standard, Whiting, Ind.; Naph-Sol in Muskegon, Mich.; Bay Refining in Bay City, Mich.; and Sohio, Cleveland.

Explains Southwest Order

Explaining the action taken in the Southwest, Deputy PAW Davies said:

"Every effort is being made to build up gasoline and fuel oil stocks without interfering with the output of petroleum war products. Through the last several months, gasoline and heating oil inventories in Gulf Coast storage tanks, which heretofore had been filled, have been drawn down. These inventories must be increased.

"Under the August allowables, the refineries will continue making the maximum quantity of war products possible. The ceiling unlimited provision will enable refineries to increase their gasoline and heating oil inventories.

"How many additional barrels a day can be run, over the 1,410,000-barrels-a-day allotment, cannot be determined at this time. It will depend on transportation facilities that can be made available. Transportation in the Southwest is still tight. We believe, however, that the quantity of additional crude runs will be appreciable."

Storm Damage Reported Severe In Gulf Coast Refineries

Special to NPN

HOUSTON—The hurricane which swept the Texas Gulf Coast area last week caused considerable damage to oil refineries at Baytown, Texas City and on the Houston ship channel. In some instances plants were shut down entirely.

A Shell Oil Co. official said it would be "several weeks" before the company's refinery on the ship channel went back to normal operations. The company reported damage to power lines and the cooling system, with one cooling tower flattened.

The Humble Oil & Refining Co. plant at Baytown was in direct path of the storm and company officials said damage would run into hundreds of thousands of dollars.

Republic Oil Refining Co.'s plant at Texas City was back to 12,000 b/d by Sunday and expects to resume normal operations in about a week. Three cooling towers at the refinery were down.

Pan American Refining Co. reported damage to its plant at Texas City, although the plant did not stop operations completely during the storm.

The Southport Petroleum Co. plant at Texas City is reported shut down.

PAW and Army Support U. S. Research In Synthetic Fuels

NPN News Bureau

WASHINGTON—Brig. Gen. Covell, chief of the Army's fuel and lubricants division, and Deputy PAW Davies urged further government work on synthetic fuels to assure the U.S. future supplies of gasoline and lubricants before a joint congressional committee here Aug. 3.

The committee, headed by Senator O'Mahoney, Wyo., is considering a bill (S. 1243) authorizing government construction and operation of demonstration plants for producing oil from coal and shale.

Interior Secretary Ickes and Bureau of Mines Director Sayers strongly supported the legislation at the hearing.

Speed Urged by Ickes

Mr. Ickes declared the synthetic fuels program should be launched without delay to "insure our future security."

"For several years past," Mr. Ickes said, "we have been consuming petroleum nearly 3 times as fast as we have been able to discover new sources. Extensions of the older fields, plus the new discoveries that have been made, have maintained our proved reserves at 19 to 20 billion bbls. We have been using about 1.4 billion bbls. a year. Thus, our known reserves are equal to a 14 or 15-year supply."

Increasing military demands, however, PAW Ickes said, together with the "chance that there may have been errors in estimates, may result in much more rapid depletion than we had anticipated."

Stresses Value of Experiments

The Secretary warned that there was no promise to make synthetic fuels cheaper than natural petroleum products. The proposed plants, he said, are to "blaze the path now for private capital to do this job when we have no more natural domestic petroleum and it becomes a question of synthetic fuel or the end of the gasoline age."

Competition with the petroleum industry is not contemplated, Mr. Ickes said.

PAW Explains Order to Humble

NPN News Bureau

WASHINGTON—PAW July 30 pointed out that WPB's cancellation of certain priorities at Humble's Baytown, Texas, refinery project applied only to several small hydrogenation facilities, not the "cat cracker" itself. WPB had announced cancellation of priorities on equipment that "was to include catalytic cracking unit for conversion of existing thermal cracking coils to hydrogenation service." Actually, PAW explained, what WPB did was to cancel priorities on the small hydrogenation facilities because of a change in design, for which priorities application has since been filed.

A reminder —to users of rubber products

In buying industrial rubber goods today the skill and integrity of the manufacturer are more important than ever before.

In building to war grade specifications — either from natural or synthetic rubber — the only ingredient that is not now rationed is "know-how"!

Goodyear's war grade products are constructed with the same capability that made their peacetime predecessors first choice in the oil industry for standout performance.

In materials, they are built from the highest-grade stocks now obtainable under WPB regulations.

Those made from synthetic rubbers embody Goodyear's two decades of experience in pioneering and perfecting synthetics impermeable to oil and gasoline.

All Industrial Rubber Products are correctly specified to the job by the G.T.M. — Goodyear Technical Man — whose practical knowledge, as you know from experience, assures proper application and trouble-free performance.

Don't take chances, get the best in rubber — *Goodyear rubber.* To bring the G.T.M. to your office, write Goodyear, Akron 16, Ohio or Los Angeles 54, California — or phone the nearest Goodyear Industrial Rubber Goods Distributor.

FREE—TO MAKE YOUR RUBBER LAST LONGER
Send for manual "GOODYEAR INDUSTRIAL RUBBER PRODUCTS CONSERVATION" — filled with complete instructions for care and repair of hose, belts, etc. Thousands in use.
GOODYEAR
INDUSTRIAL
GOODYEAR
THE GREATEST NAME IN RUBBER

Where We Stand on Aviation Gasoline

PAW Issues Statement Revealing All That Can Be Told of Industry's Amazing Record in Producing Vast Quantities of Vital Combat Fuel

NPN News Bureau

WASHINGTON—Parting the curtain somewhat on the delicate subject of 100-octane, PAW, in a statement issued July 27, reveals that a further 85% increase in production should result when improvements are completed on 28 of 47 domestic refineries which were turning out aviation fuel in June, 1943.

PAW said that by the spring of 1944 a total of 126 domestic refineries will be contributing to the production of aviation gasoline but indicated that when authorized projects, including new construction, are completed there probably will not be a need for additional units to be built "from the ground up."

The statement paid tribute to the industry in meeting the staggering demands of the military through utilization of "old facilities and make-shift facilities" and in "the remarkable progress" made in constructing new facilities in spite of the difficulties encountered in getting construction material.

It revealed that 100-octane was being manufactured in a number of United Nations' refineries and that these were being expanded. Further details were withheld.

Following is the complete text of the statement:

100-Octane Aviation Gasoline Statement By The Petroleum Administration For War

The Petroleum Administration for War has regretted that the necessities of military secrecy have prevented it from presenting all of the facts concerning 100-octane aviation gasoline, the job which the petroleum industry has done in greatly increasing production out of old facilities and make-shift facilities, the remarkable progress which has been made in constructing new facilities in spite of the difficulties encountered in getting construction materials, the urgent and ever increasing requirements for this vital combat fuel, the production now and the ultimate production to be attained. However, it is not possible to give the full facts on any of these items and it appears probable that the whole story cannot be told until after "V Day."

In spite of the difficulties in the situation, the Petroleum Administration recognizes that its duty to the public requires that it supply, freely, such information as may properly be published, and this statement has been prepared to discharge that responsibility.

How Much Aviation Gasoline Are We Making?

The Petroleum Administration cannot say how much aviation gasoline is being made and does not wish to encourage any speculation as to the quality. Further, it does not now appear probable that there will be any time during the war when such information can be made available. It is a lot of gasoline. It is a lot more gasoline than the military service indicated that they were going to require of us at this time. It is not anywhere near as much gasoline as our Air Forces could use to good advantage. However, there are certain facts which can be stated which illustrate the progress made.

In January, 1942, there were 22 refineries within the United States which were making some 100-octane gasoline or some major ingredient such as base stock or blending agent. In June, 1943, there were 47 such refineries. While each one of these 47 refineries was making 100-octane gasoline, construction of still more new facilities was in progress at 28 of the 47 refineries. When all of the construction work in progress in this group of 47 refineries is completed, they will be able, collectively, to produce 85% more aviation gasoline than they produced in June, 1943.

There are 26 other refineries in the United States which are scheduled to make 100-octane gasoline in which plants for that purpose are now in the course of construction. From now until the early Spring of 1944, more and more of these 26 plants will go into operation each month. In addition to the 47 refineries now producing 100-octane gasoline and the 26 refineries which are still scheduled to produce the product but which are not yet in production, there were 72 refineries which in June, 1943, were making codimer. This codimer after hydrogenation becomes a valuable blending stock which goes into our current production of aviation gasoline, is greater than that of any single present producers except the two largest producers. However, some of these 72 refineries which are producing codimer are also producing or are scheduled to produce 100-octane gasoline as well. As a result we have a final net figure of 126 domestic refineries which are contributing or which are scheduled to contribute to the ultimate production of 100-octane gasoline.

Is 100-Octane Gasoline Being Manufactured Outside The United States?

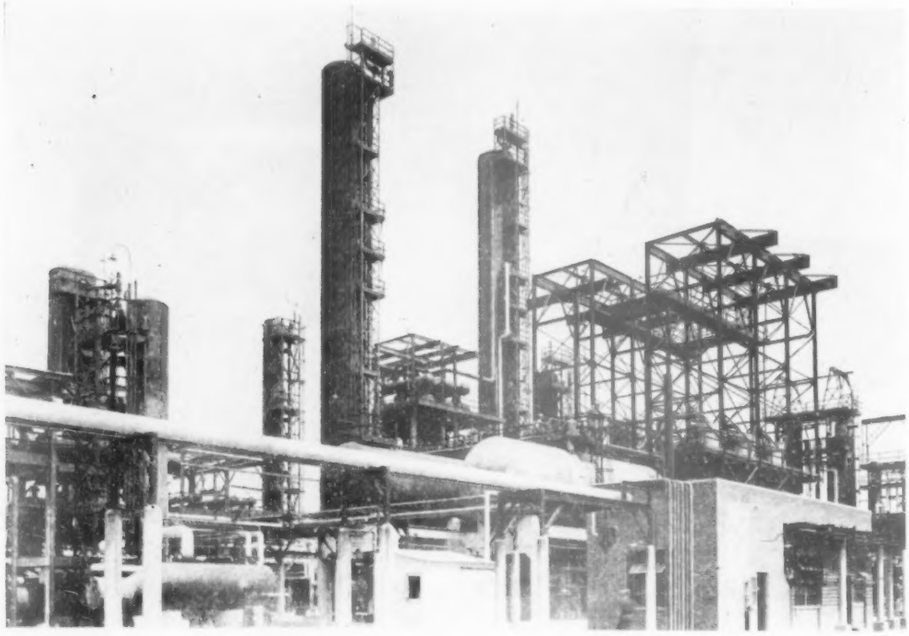
One hundred octane gasoline is being manufactured in a number of United Nations' refineries outside the United States and production at these refineries is being expanded. Little more can be said on this subject.

How Did We Increase Production Without Building New Plants?

In January, 1943, our domestic refineries produced several times as much aviation gasoline as they did the year previous in January, 1942. However, very few new 100-octane units, construction of which started after the war commenced or just prior to the war, were in operation in January, 1943. The expansion made in production was made by other emergency measures. One of these measures was to increase the amount of tetraethyl lead in 100-octane gasoline. Another was to remove the bottlenecks in the existing plants. Still a third very important expansion was obtained by utilizing prewar facilities in other refineries for the production of certain special ingredients. Finally, a very large increase in production was obtained by running all of the refineries as one in the sense that the components available were blended in such a way that produced the most gasoline regardless of the companies and refineries in which these components originated.

Are More 100-Octane Plants Necessary and Are They Going To Be Built?

The best answer that can be made to this question at this time is a qualified "No". When all of the plants now scheduled to be completed are in operation, the amount of gasoline which they will produce will approximate the highest demand yet indicated by the Military. However, there is another better reason for



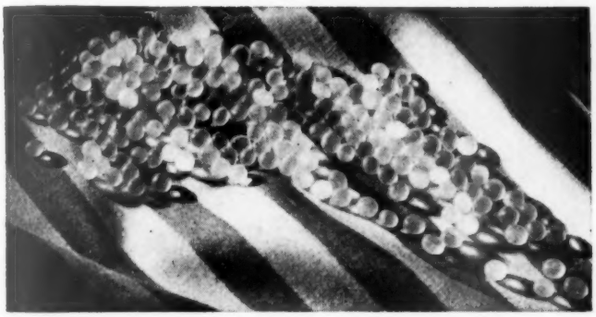
This photograph shows the largest alkylation unit now in operation in the world. It is located "somewhere in the U. S." and is only a part of one company's facilities for turning out super fuels for the U. S. Air Forces

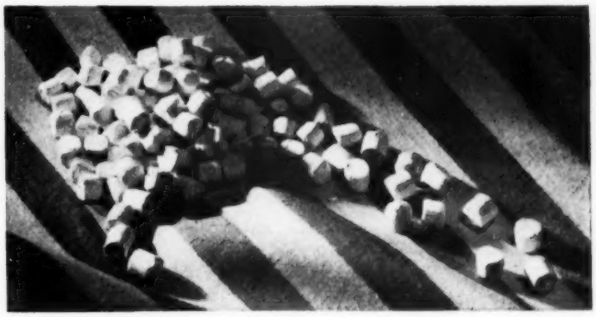
BADGER

Brings Experience to the New and Improved THERMOFOR CATALYTIC CRACKING PROCESS

The majority of the catalytic cracking units representing most of the catalytic cracking capacity now in actual operation are *Badger-engineered* and *Badger-built.* This experience, dating from the first commercial catalytic cracking, is now being applied to Thermofor Catalytic Cracking Units under design and construction using

SOCONY-VACUUM SYNTHETIC BEAD CATALYST *or* SOCONY-VACUUM CLAY PELLET CATALYST





— in conjunction with new and improved catalytic equipment of Badger design for the production of

Maximum FLYING HORSEPOWER

E. B. BADGER & SONS CO. EST. 1841

BOSTON • New York • Philadelphia • San Francisco • London

Licensing Agents, Engineers and Constructors for THERMOFOR CATALYTIC CRACKING *and* HOUDRY CATALYTIC CRACKING *licensed by Houdry Process Corp.*

PROCESSING AND CONSTRUCTION ENGINEERS FOR THE PETROLEUM, PETRO-CHEMICAL AND CHEMICAL INDUSTRIES

saying "No" and qualifying it somewhat. This reason is illustrated by happenings in recent months. Since the middle of April, 1943, 183 separate 100-octane construction projects have been approved by the Petroleum Administration and by the War Production Board. However, of these 183 projects, 71 were projects of such a nature that less than $10,000 needed to be expended and 46 more came within the bracket between $10,000 and $50,000. Only 27 of the 183 projects involved expenditures of as much as a million dollars.

It is well known that the installation of a complete 100-octane unit in an existing refinery usually involves the erection of a catalytic cracking unit and an alkylation unit as well as certain auxiliary equipment and that in the Spring of 1942, the average cost of such a unit was estimated at about $2400 per daily barrel of 100-octane gasoline. Obviously there is a vast difference between the type of projects which have recently been approved and most of the fundamental projects of last year. This difference does not reveal poor judgment exercised last year nor is it due entirely to technological advance. It is due primarily to the fact that as we gain more experience in 100-octane production we find that small changes in plants operating or about to operate will produce considerable increments of products. Hence, the expansion which is likely to occur in manufacturing facilities from now on out is one of relatively small changes in units already authorized rather than in the expenditure of material to build new units from the ground up.

What Processes Are Being Employed In Making 100-Octane Gasoline?

Perhaps we should talk first about some of the unusual processes which have only relatively small part in the present program. There are several projects which involve the use of butane gas rather than liquid petroleum as a raw material. The light hydrocarbon stream usually obtained as a by-product of natural gasoline manufacture is cracked to produce raw materials for alkylate and the alkylate is blended with a base stock obtained from natural gasoline. As a variation of this, isobutane, if not available in sufficiently large quantity in the butane stream, is made by isomerization the same as it is in other installations which rely on gas oil or similar charging stocks for butane availability.

The present program also, includes a few uses of what might be called "trick" cracking processes which depend for their excellence partly on the selection of a particular cracking stock. However, this type of process is the exception rather than the rule. Most of the 100-octane installations now built or building have depended primarily on the installations of a catalytic cracking unit to produce high octane base stock and to produce the necessary components for alkylate manufacture. These plants have, of course, also included an alkylation unit along with the catalytic cracking unit. Some of the plants include units to produce isobutane by isomerizing normal butane.

The catalytic isomerization process has also been adapted to work on a heavier hydrocarbon such as the pentanes and hexanes in order to provide high octane volatile components for base stock.

Considerable interest has been evidenced in the type of catalytic cracking units installed and the type of alkylation units installed by the various refiners. It is not felt that any official figures as to the number of fluid cracking units, the number of Houdry cracking units, the number of Thermofor cracking units, or the number of other types of cracking units installed can properly be given. Similarly, it is considered unwise to give official figures on the number of sulphuric acid alkylation units and the number of hydrofluoric acid alkylation units which are scheduled to operate. However, there are certain general comments which can be made and which may be of interest.

Number of Units Is Not A Criterion Of Relative Excellence Of Processes

It must first be remembered that whatever the relative number of the different types of units may be, that number in no way reflects the relative excellence of the different types of processes. There are a number of reasons for this. Perhaps the most important is that some of our 100-octane units were designed before the war, some in the early stages of the war and some only currently. When a decision was once made to use a particular type of process and when engineering, purchasing and construction work has commenced, the Petroleum Administration could not permit a refiner to change his mind merely to attain a higher degree of predicted excellence. The need for 100-octane gasoline has been too great to permit "second guesses". It must be borne in mind that the relative excellence of each of the various types of catalytic cracking processes depends a good deal on the use that is to be made of the particular cracking unit. Local excellences exist. One type of operation may be better to make butylenes and not quite so good to make base stock, and vice versa. Further, technology is advancing so rapidly that any conclusion reached at the present writing concerning the relative excellence of one process over another is very apt to be overturned in less than a month. A sort of horse race has been going on. Each contestant has always claimed his process was the best. From time to time one or the other of the contestants has brought out a new feature which for the moment at least makes his process look vastly better than any of the others. However, there is no monopoly on ingenuity and the other contestants work very hard to achieve as good or even better result.

Further discussing the subject of the various types of units which have been installed, it can be stated that two of the cracking processes which now appear to be very useful were not even known to the public at the time the war started and consequently could not have been used in the early stages of the program regardless of their merit.

The Petroleum Administration has not made any effort at any time to force any refiner to use or not to use any particular process, equipment or contractor. The 100-octane program has always been about three-quarters privately financed and even the quarter that has been financed through the Defense Plant route has carefully been kept in the hands of the refiners themselves for exercise of their own judgment as to their needs. The activities of the Petroleum Administration have been purely critical. When a particular plan submitted has not been deemed sufficiently good, the Administration has not hesitated to object to it but at the same time it has made no effort to regiment thinking or regiment processes.

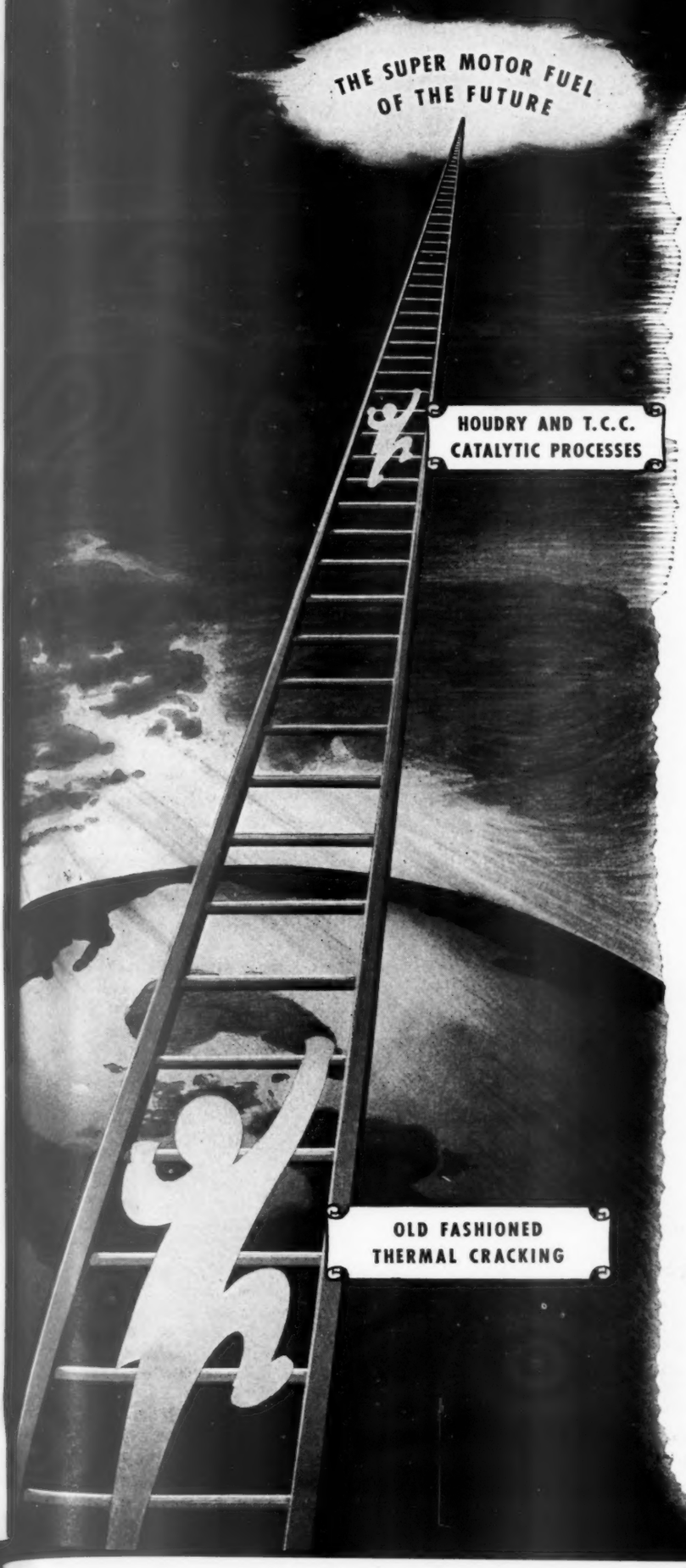
As a result, the selection of the various processes by the various refiners has proceeded along normal lines in which the sponsors of each process have competed for the favor of the various refiners. Naturally, those companies such as Standard Oil Company of New Jersey, Texas, Shell and Standard Oil Company of Indiana which are interested in and which participated in the development of the Fluid type of catalytic cracking unit have chosen to favor that type of unit. Naturally enough, the Socony and Sun group which had aided in the development of the Houdry process and later the Thermofor process have tended to favor that unit with respect to their own installations. Those refiners who sought the engineering help of the Universal Oil Products Company tended to favor the Fluid type of unit which was designed and sponsored by Universal, and so with the other design and construction companies and their respective customers.

The same situation has prevailed with respect to alkylation units; that is, the companies who know the most about the sulphuric acid process tended to use it and those who knew the most about the hydrofluoric acid alkylation unit tended to favor it.

Consolidations Of Techniques

What was notably true in peacetime about refinery technology is still true in wartime, namely, that while the proponents of various new processes are at first very much impressed with the difference between their process and those of their competitors, as time goes on the process features tend to grow together even though they have separate origins, and each process tends to look more and more like each other process. This of course, is the result of the gradual adaptation by one process of what it can use of the developments of another process. This tendency, noticeable in peacetime, has been augmented in wartime due to the voluntary cooperation of the oil companies and the complete freedom of cross licensing which exists during this war. One of the most valuable forces in the production of aviation gasoline has been the Aviation Gasoline Advisory Committee appointed by the Petroleum Administration, which committee acts as an arm of the Refining Division of P.A.W. The Committee members were deliberately selected because of their personal experience in this field and they were naturally enough selected from different companies using different processes in order to make sure that the Administration would have available the best possible cross section of technical thought. It is interesting to note that the members of this Committee and the supporting Sub-committees are able to work together peaceably and to exchange data with respect to their various processes with the result that each man knows all that he reasonably needs to know about any process.

THE SKY'S THE LIMIT FOR POST-WAR GASOLINE QUALITY



-but Houdry licensees *start* nearer the top!

One needs no gift of prophetic vision to foresee what is going to happen in the petroleum refining business after the war. The handwriting is in the sky. Tomorrow's super motor fuels, like today's 100-octane aviation fuel, will depend on *catalytic* cracking for their higher quality standards.

And 90% of *all* catalytically cracked aviation gasoline has been produced by Houdry processes. Seventeen Houdry units are now in operation—41 additional Houdry and T.C.C. units are in various stages of construction.

Much of this equipment has been financed by Houdry licensees out of their own pockets—a gratifying demonstration of their faith in the future. Thus, these companies will begin the post-war competition for motor fuel markets with a priceless advantage. They will have the equipment and the experience with which to produce gasoline far *better* than pre-war standards, far *cheaper* than by pre-war methods.

Largest licensor in the industry, based on refining capacity, Houdry offers not one but *three* catalytic cracking processes, each especially suited to certain types of refining operation and certain charging stocks. They are the Houdry Static Catalyst Process, Thermofor Catalytic Cracking Process and the Houdry Adiabatic Process. These three outstanding processes are available to all American refiners, under license arrangements, subject to approval by the United States Government.

HOUDRY CATALYTIC PROCESSES
... FOR VICTORY IN WAR
... FOR PROGRESS IN PEACE

HOUDRY PROCESS CORPORATION
Wilmington, Delaware

Licensing Agents:

E. B. BADGER & SONS CO.
Boston, Massachusetts

THE LUMMUS COMPANY
New York City, New York

BECHTEL-McCONE-PARSONS CORP.
Los Angeles, California

Womanpower in Refineries Surveyed

PAW-Labor Department Study Shows Women Handle Operating Jobs As Well as Office and Laboratory Jobs. Training Programs Outlined

NPN Staff Special

WASHINGTON—Women are moving into refineries to take the place of men as gagers, pumpers, operators of cranes, stills, stabilizers and centrifuges, tank car loaders, and in a variety of other once unheard-of operations. Extent of this influx is shown in a survey just completed by the Labor Department's bureau of labor statistics in collaboration with PAW.

Women now comprise about 10% of total employment in petroleum refineries, although some individual refineries approach 25%, the survey discovered. Highest proportion of women—18% of total employment—is found on the West Coast.

West Coast Leads U.S.

District 5 (West Coast) also shows the highest use of women in actual refinery operations. Percentage of women engaged in refinery work is 57% of all women employed, compared with only 15% in office work. In all other districts, office employes account for 50% or more of all women employed. Districts 2 (Midwest) and 4 (Rocky Mountains) showed the lowest use of women in actual refinery work—3% and 1%, respectively—and the highest proportion—over 80%—in office work. For the entire industry, the survey indicates, 33% of all women are employed in refinery operations and 44% in office tasks, with the rest distributed among maintenance (1.5%), laboratory (18%), and "other" (4%).

The survey was made by James Silberman of the Bureau of Labor Statistics, and George Dewey, assistant labor counselor of PAW. Data was gathered from Selective Service System replacement schedules and other personnel records and from interviews with company officials. The 74 companies surveyed employ about one-fourth the personnel of the entire industry.

Practices Vary

Interviews revealed varying practices in designing jobs for women and in recruiting, training and placing women in the jobs.

"Job dilution"—grouping fewer duties into individual jobs, so that more women are required in proportion to men—is common, although in many cases women have replaced men on an equal basis. Some companies have analyzed each job into unitary skills and recombined these elements into complete jobs which can be performed most satisfactorily by women.

Some company officials consider women particularly suitable for refinery operations which require a sense of timing and ability to keep track of several continuous duties, believing that these quantities are carried over from women's household experience. Usually, top operating men supervise the women and additional men are placed on the same units to handle emergencies.

The limited physical strength of women—recognized in some states by laws prohibiting employment of women in jobs requiring heavy weight-lifting—must be kept in mind in job-designing, the survey points out.

Some Reorganize Work

Refineries have met this consideration by reorganizing the work so that its heavier elements are assigned to men or by installing mechanical aids, such as counter-balances, rollers, and conveyor belts, which in some cases have even reduced labor cost. One company reported that installation of a short stretch of conveyor track made it possible for 18 women to do the work formerly performed by 24 men.

The experience of the companies interviewed indicates that women are suitable for most refinery work not requiring considerable physical strength, and for work in refinery offices, laboratories, and research departments. They have not performed so effectively on maintenance, engineering, and general labor. Apart from the physical qualifications, they generally lack sufficient education and experience in handling machinery and complicated equipment and background in refinery work.

125 Categories Listed

The survey lists 125 specific job categories in which women are now being used. Of these, 45 are refinery operating jobs, 36 are office positions, 14 are in laboratories, 19 maintenance operations, and 11 "other".

For the most part, recruitment of women for refinery work has been carried on through company personnel office and the U. S. Employment Service. Wives, daughters and relatives of employes, however, have been recruited successfully by many companies.

Advantages of using this source of labor are the greater knowledge of refinery operations these women bring to the job, gained from conversations at home, and the lesser strain placed on housing and transportation facilities by using local labor supplies.

Although most women in refinery work to date are under 35, the tendency to hire only younger women is being relaxed somewhat. One refinery reported successful use in its laboratory of women between the ages of 55 and 60.

One Company's Program

When the decision to employ women has been made, and before the women employes come on the job, some companies have called general meetings of all male employes to explain the necessity of hiring women and the importance of utilizing them effectively. It is emphasized that the men can contribute to this end by voluntarily assuming some of the heavier duties.

Techniques of training and placement have varied with the individual situation. One refinery, confronted with a heavy loss of personnel in a short time, set up an extensive training program. Selection of applicants was guided by specially prepared tests and basic job specifications.

The training itself was divided into three stages. The first, or "induction period", was originally planned to last up to four weeks but

On top of a "run down tank" at the refinery of Macmillan Petroleum Corp., Long Beach, Calif., these girl laboratory workers are taking samples for test purposes

VICTORY

ON Fifth Avenue, one of America's finest war memorials commemorates the valor of a great division that fought to victory in the last war. Nearby, on the spacious lawns of a park, children play in happy freedom — the richest fruit of that victory. The men who fought for it bid us remember that this freedom was hard-won. And they ask that America's memorial to them be a victory that will never again be challenged.

AMERICAN FLANGE & MANUFACTURING CO. INC., 30 ROCKEFELLER PLAZA, NEW YORK 20, N. Y.

TRI-SURE PRODUCTS LIMITED, ST. CATHARINES, ONTARIO, CANADA

Tri-Sure

CLOSURES

has been cut to 10 days or less by improved teaching procedures. Classes of 8 to 10 girls —the size found most desirable to encourage questions and discussion—are introduced to the facilities, layout and general work routine of the refinery by experienced operators who demonstrate the operation of equipment and give instruction in general "safety precautions.

Operate "Dummy" Equipment

The "training period" follows, extending from 6 to 8 weeks. The women are provided with a manual of rules and procedures for refinery operations and put to work on dummy or obsolete equipment. Their instructors are practical operators and technical men who have earlier proved themselves patient and capable of teaching others.

During this period it is determined what jobs the women are best qualified to perform. Those most likely to adjust themselves to shift operations—usually married women in their late twenties or early thirties—are also segregated at this time.

Training is given in how to open and close valves, fire stills and boilers, start and stop pumps, gauge tanks, handle laboratory equipment, and various other refinery operations. They are taught to control fires and to handle other emergencies that may arise. Small fires are started for the women to extinguish with proper equipment.

The final stage of training is the "provisional employment period". The name reflects the fact that in the beginning the reasonableness of the new jobs created for women (by regrouping of job junctions) had yet to be tested by actual experience. The women are assigned to their permanent refinery jobs, where they are allowed to set their own pace and encouraged to suggest adjustments.

The jobs are usually of a helper status. The women are paid the same rate as men for comparable work. When jobs are dissimilar, wage rates commensurate with responsibilities are established.

Another Company's Plan

In another company, not faced with an immediate labor shortage, women are hired three or four at a time for each department and gradually assimilated into the organization. Experience is acquired on the job, and graduation to more responsible operating and service positions comes as seniority is gained and vacancies occur.

Another company has adopted a 4-day training course consisting principally of conducted tours, during which equipment is pointed out and the duties of jobs explained. Explanatory signs placed on the equipment have proved useful, the company reported. Daily classes are conducted to give the women a very elementary knowledge of chemistry and refining processes.

Several company officials stressed the desirability of having women become accustomed during the training period to coming to work in appropriate clothing. Uniforms are generally not required; but denim coveralls or slacks, a bandana or cap, and gloves are commonly recommended.

Need Elementary Training

During the early training period women must learn the basic information—the refinery layout, where tools are kept, how things are done, and to whom to go for direction and information—that men, upgraded from the labor gang into operative jobs, already know. They must be given comprehensive and detailed instruction in the most elementary aspects of refinery techniques, and introduced gradually to unfamiliar activities.

Not only must the women be fitted to the job but the refinery environment must be adapted to the women, experience shows. Special rest and change rooms should be provided close to the areas of work. Tables and benches right on the job, so that women may eat together if they prefer, are helpful.

Several refineries retain women personnel advisers to facilitate adjustments and to forestall various difficulties. Supervisors who have effectively handled men may not be able to deal successfully with women. Most company officials report that women respond better when directly supervised by men than when supervised by women.

Synthetic Tires Pass Rigid Bus Test, U. S. Rubber Says

NPN News Bureau

NEW YORK—Rapid rise in the consumption of synthetic rubber was revealed by the United States Rubber Co. July 27 when Board Chairman F. B. Davis, Jr., announced that the use of synthetic rubber in June was three and a half times that for April. Mr. Davis said that his company, cooperating with the Government's program, has two synthetic rubber plants already in operation for the U. S., one at Naugatuck, Conn., and the other at Institute, W. Va. A third plant at Los Angeles will be put into operation by September.

"These three plants", said Mr. Davis, "have a rated annual capacity of 150,000 tons of Buna S, which is equivalent to nearly one-quarter of the normal peacetime consumption of rubber in this country for all purposes."

Buna S, the type of synthetic rubber which the company produces for the Government, is used in the manufacture of tires, footwear, mechanical goods, drug sundries, and other items. Other types of synthetic rubber are used for the lining of airplane fuel tanks, the making of raincoats and coated fabrics for the armed forces.

U. S. Rubber Co. also announced last week completion of the most rigorous tests yet made on heavy-duty synthetic-treated tires over a full year of operation on the buses of the New Jersey Public Service Coordinated Transport. Buna S was used in these tires, and many different compounds and types of construction were used to find the most durable and efficient combinations. Mileage ran as high as 37,000 per tire, U. S. Rubber says, and steady improvement was shown in the product throughout the year's test.

Tires tested were built in four sections with a different compound in each. The relative worth of the compounds was then noted on each tire. When one section wore through, the tire was removed even though rubber remained in the others.

No failures were recorded during the year of experiment apart from normal wear, the company reported. Every type of road and operating condition was duplicated in the tests, including paved to cobblestone roads. Synthetic tubes also were used in the test and results were pronounced satisfactory.

Larger Tires Pose Problem

The chief question about synthetic rubber tires has been in regard to the larger size tires where peculiar problems are encountered, according to Dr. Sidney M. Caldwell, tire research expert for U. S. Rubber. The larger tires developed too much heat in flexing. But this difficulty was overcome to great extent by reducing the carcass in thickness while maintaining its strength. This was best accomplished with the replacement of cotton in the carcass with rayon, a stronger fabric, and less heat producing, he said.

So marked has been the improvement in synthetic rubber that Rubber Director William M. Jeffers said last month that after the war synthetic rubber would be able to hold its own with natural rubber both as to use and cost.

"Synthetic rubber is here to stay", he said. "And when I say it can hold its own, I mean hold its own without tariffs or subsidies."

Mr. Jeffers added: "Naturally the cost of synthetic rubber after the war will depend in large part on the cost of petroleum, alcohol or other products from which it is made." He predicted synthetic rubber would be produced at from 8 to 15 cents a pound.

Mr. Jeffers said concerning synthetic rubber tires for passenger cars: "I'd just as soon have synthetic tires on my car. They will wear just about as well and last just about as long. And experiments indicate they will hold up remarkably well at high speeds."

Off-Job Deaths in '42 Top Plant Fatalities

NPN News Bureau

CHICAGO—Accidents outside of working hours killed 26,500 American workers during 1942, or 8000 more than were injured fatally during hours of employment, the National Safety Council has reported.

The council revealed that it has blended its plant safety campaign into an around-the-clock effort to reduce accidents, giving emphasis to the vital off-the-job phase of an employe's daily routine. Regardless of where an accident strikes a man down, time is lost from work, Ned H. Dearborn, executive vice-president of the council, points out.

Such accidents are particularly to be deplored during these days when absenteeism presents such a serious production and personnel problem and when the nation's full manpower must be fully utilized in the war effort, he said.

Figures assembled by the council revealed that in addition to the fatalities, 2,200,000 workers suffered non-fatal, time-losing accidents off the job, 300,000 more than the total who suffered non-fatal, time-losing accidents while on the job.

More than 2000 plants are using the material in their efforts to curb off-the-job accidents, the council reported.

Mr. Dearborn said the council would welcome inquiries on the part of others who might wish to participate in the campaign. Letters should be addressed to him at 20 North Wacker Drive, Chicago 6, Ill.

There's only one Dive Bomber scares us—

and it's only half an inch long!

BUT BROTHER, when these midget Mitsubishis "peel off" and strafe a man . . . he's sunk!

I'm talking about these king-size mosquitoes, down here. The ones that hand out malaria.

Ever have the stuff? They say it wrings a man out like a washrag. He doesn't want to eat or talk or do anything but sleep—and he doesn't enjoy that! Well, these baby dive bombers may scare us, but we've learned how to handle them.

We do it with oil!

We spread larvacide, containing oil, on every stagnant pool of water within miles of camp...even a wheel rut with water in it gets a dose. The treatment turns the wrigglers into corpses in the mosquito breeding places.

As for the big ones that get blown into camp from maybe 100 miles away—we got whole squads of men whose special duties are to hunt them down with spray guns full of bug juice made with oil. One sw-i-s-h of that gun and *they're* through.

I'm sorta fond of oil . . . I don't think I'd like malaria.

Petroleum vs. Pests

Maintaining health and morale among troops through pest-control is not the kind of war work that makes headlines—but just ask a soldier whether it's important or not!

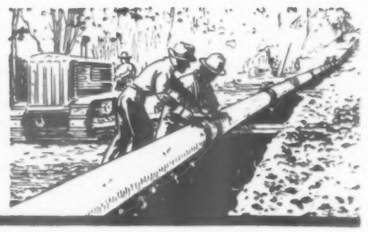
Yet, pest-control is only one factor in the huge war job of the American oil industry, which is producing, refining, and transporting one of our most essential war materials . . . *petroleum.*

We are proud that Gulf is privileged to share in this tremendous task.

GULF

GULF OIL CORP.
GULF REFINING CO.

Oil TRANSPORTATION



Colorado Truck Crisis Delayed

Truce Declared Until Sept. 7 at Army's Request When Collection of Fees on Overloads Partly Paralyzes Oil and Other Vital Transport

Special to NPN

DENVER — Filling station tanks went dry, the grain harvest came to a standstill and 2 million pounds of essential freight piled up in Denver truck terminals last week while motor carrier operators and state officials squabbled over new fees for overloaded vehicles.

Vital supplies started moving again, after a three-day tieup, under a 40-day moratorium. Colorado citizens had been given a taste of what is in store for them unless the long smoldering conflict between truck operators and the Colorado highway department is settled permanently.

Credit for formulating the "armistice", which expires Sept. 7, goes to Capt. Hallie L. Myers, transportation officer of the Army's Seventh Service command, Omaha. Myers came to Denver, together with Capt. Edward Stubbs, Army Air Forces transportation officer, when stoppage of gasoline carriers threatened to ground airplanes and the movement of supplies for Colorado's many military establishments was delayed.

During the 40-day wait, while army, federal and state representatives confer on a permanent peace, no attempt will be made to enforce the new schedule of fees set up by the State Highway commission with the approval of the governor.

The fees, which add $200 to $1000 annually to the operating cost of overlength and overweight motor carriers, were promulgated by the commission. State Highway Engineer Charles D. Vail, urging the new licenses, said overloaded trucks were causing a million dollars damage annually to Colorado's highway system.

"I hope the fees are high enough to keep these bridge breakers off our roads altogether," Vail said.

Patterson Issues Appeal

The Colorado Motor Carriers association fought the special license order in the Denver district court on the grounds that the commission had usurped the prerogative of the legislature. The carriers proved truck operators paid ton-mile taxes into the highway fund in excess of a million dollars for the year ending June 30, 1943. The carriers lost their suit and Engineer Vail issued orders to the State Highway patrol to summon violators of the overweight regulations into court.

Acting Secretary of War Robert P. Patterson and ODT Director Joseph B. Eastman entered the Colorado controversy with appeals to Gov. John C. Vivian to intervene and cancel the collection of fees for special transport permits. They pointed out Colorado was the only state making a charge for these permits.

"If your program of charging for these permits is put into operation," Secretary Patterson wrote, "it will establish a dangerous precedent which will inevitably be followed by other states and which can only result in serious barriers to vital war traffic."

Colorado truckers appealed to the governor. They said they were between two fires—the state's prohibitive license for overloads and the ODT order to carry loads up to tire capacity. The governor refused to intervene and enforcement began. The truckers then announced all illegal vehicles would be withdrawn for Colorado highways. State officers of Nebraska and South Dakota invited the carriers to operate in those states, promising cancellation of all license requirements.

Appeal to Washington

When harvesting in Eastern Colorado slowed down because fuel was not available for the big combines, Chairman Dewey Harman called a special meeting of the Colorado War Farm board. Appeals were sent to Washington for action to break the bottleneck.

Action came quickly when a state patrolman refused to allow a private truck operator to transport a heavy gasoline shovel from Leadville to Camp Hale, mountain troop training camp, without payment of a special fee. The distance is 12 miles and the cost of the permit for the trip would have been $55.

The army didn't get its equipment but Capt. Myers hastened to Denver to confer with Vail and the truckers. The 40-day moratorium resulted.

Colorado is dependent upon continuous operation of every available carrier for its motor fuel supply, George Douglas, executive secretary of the Colorado Petroleum Industries, points out. Railroad tank cars which formerly supplied a large share of the state's motor fuel, were transferred to Eastern shortage areas, he said.

"A day lost in transporting gasoline can never be regained," Douglas said.

Denver Area Well Supplied

The Denver area has two refineries and enough legal-size trucks which proved sufficient to supply Denver motorists the three days the big trucks were idle. But the rest of the state is dependent upon transportation from refineries at Craig and Florence, in Colorado, and from plants in Wyoming and Kansas. It was the out-of-Denver citizens who first felt the pinch of the transportation breakdown.

Henry S. Sherman, chairman of the Colorado Public Utilities commission, has been named by Gov. Vivian to represent the state in attempting to work out a permanent solution of the license fee controversy. Sherman's first action was to order a census of all vehicles under the appraisal permit regulation. He also will attempt to evaluate present and future damage to Colorado highways from overloaded vehicles.

"I will work with army and ODT officers in an effort to arrive at a basis of agreement which will keep supplies moving and protect the state against undue financial burden," Mr. Sherman said.

Eastman Warns States Against Revival Of Truck Barriers

NPN News Bureau

WASHINGTON—State barriers to motor transports—particularly tank truck—operations threw lengthening shadows last week with the warning by ODT Director Eastman that "the time has not yet come when we can afford to let up in our efforts to squeeze every possible ton-mile performance out of all our petroleum transport equipment."

He decried the growing tendency on the part of a few state governments and some petroleum shippers to relax their cooperation in wartime petroleum transportation programs.

Mr. Eastman expressed regret that a few state governments had in recent weeks tended to revert to the pre-war practice of enforcing state barriers. In one state, he reported, all petroleum tank truck movements had ceased because of a highway regulation requiring high fees for the operation of vehicles carrying loads above specified limits.

Such regulations, designed to protect state highways, may result in dangerous operations of tank trucks, waste of transportation and delay or complete stoppage of movements of war materials, the ODT Director said.

In order to keep their loads within maximum limits, drivers may be forced to operate large transports with less than capacity loads of petroleum products. The greatly increased movement of the liquids and the accumulation of gases within the tank endanger the lives of the drivers and others on the highways, Mr. Eastman warned.

He urged state governments to do everything possible to facilitate the movement of war materials—particularly oil—in trucks across and within their states.

More Tank Cars Needed

He also urged petroleum shippers to cooperate in the ODT's efforts to divert short-haul movements of oil from tank car to the tank truck which can handle them most efficiently.

"Although we have freed some 16,000 tank

Help Us to Help *You* and the *U.S.A.*

RESPONSIBILITIES OF THE CAR AND TRUCK OWNER

Keep tires properly inflated

Keep radiator and battery filled

Get skilled check-ups regularly

RESPONSIBILITIES OF YOUR CHEVROLET DEALER

Check your cars and trucks carefully

Give them skilled, reliable service

Help to keep them serving dependably

BUY U.S. WAR BONDS AND STAMPS

BUY U.S. WAR BONDS AND STAMPS

CHEVROLET

Help us to

"SAVE THE WHEELS THAT SERVE AMERICA"

★ ★ ★ ★ ★ ★

Remember **— Chevrolet Dealer Service Is America's Most Popular Service**

All Makes of Cars and Trucks

CHEVROLET MOTOR DIVISION, *General Motors Corporation*, DETROIT, MICHIGAN

cars through this program," he said, "we shall continue to need every tank car we can make available through this or any other effort."

Background Is Recalled

Background of the effort to bring about elimination of conflicting truck regulations which were hampering war transportation is as follows:

A conference was called by Commerce Secretary Jones for May 5, 6 and 7, 1942, which was attended by more than 200 state officials who were informed by the heads of several war agencies that there was serious delay in transporting war material and equipment to the various strategic areas through the U.S. because of different state laws, rules and regulations governing weight loads, lengths, heights, and so forth, of motor transportation through the different states.

Following the conference, the President appointed a committee to consider the matter, consisting of Mr. Jones, Chairman; Henry Morgenthau, Secretary of the Treasury; Attorney General Biddle; Under Secretary of War Patterson; Assistant Navy Secretary Ralph Bard; WPB Chairman Nelson; Leon Henderson, then OPA administrator; Manpower Chief McNutt; and ODT Director Eastman.

The committee met on May 20, 1942, with the Executive Committee of the Governor's Conference, consisting of Harold E. Stassen, Minnesota, Chairman; Herbert H. Lehman, New York; Herbert R. O'Conor, Maryland; J. Melville Broughton, North Carolina; Leverett Saltonstall, Massachusetts; and Frank Bane, executive secretary. The executive committee of the Governors' Conference agreed:

1—That the solution of the difficulty should be referred to the states.

2—That uniform minimum standards for motor transportation, developed by a number of the states in cooperation with the U.S. Bureau of Public Roads and approved by the War Department, were satisfactory standards for the duration of the emergency.

3—That the Council of State Governments would devote all of its energies toward securing approval of these standards on the part of all the states within the next 10 days.

Announced Agreement

On June 2, Mr. Jones announced that all 48 states had agreed to uniform minimum standard and reciprocal license arrangements with respect to motor transport for the duration.

At that time, he expressed the conviction that the governors of the 48 states and Mr. Bane, had performed a genuine service to the country as a whole.

Following is the emergency formula governing minimum sizes and weights of commercial motor vehicles which the governors approved for the duration of the war:

1—Permissible width—96 inches.

2—Permissible heights—12.5 feet.

3—Permissible length of a single vehicle—35 feet.

4—Permissible length of a combination—45 feet.

5—Permissible weight per inch width of tire—600 lbs.

6—Permissible weight on single axle—18,000 lbs.

7—Permissible weight on two axles—30,000 lbs.

8—Permissible weight on three axles—40,000 lbs.

9—Permissible weight of semi-trailers—40,000 lbs.

10—Permissible weight of other combinations—40,000 lbs.

This formula, however, only served to bring subnormal areas up to certain minimum standards. By the end of June, 1942, there was a flood of letters and telegrams to Washington that the standards were too low and Mr. Eastman indicated the standards might have to be raised.

Handles States Separately

On July 5, 1942, Mr. Eastman said he would not ask for increased limits on a national basis but would approach separate states from time to time on higher limits.

The first area affected by higher limits was the New England states. There, there was the need for moving heavy fuel oil in large tank trucks. This combination often resulted in gross weights of 42-45,000 lbs. and more. Governors of all the New England states extended full cooperation on the problem—but in an informal manner and not with passage of any laws.

However, according to an NPN survey, trade barriers are cropping up more and more with the apparent feeling by the states that the war is going well and that they should get busy raising revenue for upkeep of highways, etc. Revenue from gasoline taxes has fallen off enormously because of gasoline rationing.

Virginia has tightened up in the last few weeks with wholesale arrests reported of truckers crossing into the state with over-the-limit loads. The truckers defend themselves by pointing out that they are attempting to comply with ODT orders calling for full loads, etc., but this hasn't seemed to cut much ice with the Virginia weight authorities.

About the only trucks now allowed to escape Virginia's hard hand are those moving into Army post stations and camps or those who carry a letter from the Army showing the need for the movement in which case the Virginia authorities do not weigh the trucks at all.

North Dakota Cracks Down

Another instance of a state cracking down on truck load limits has been North Dakota. There, this spring, the authorities wanted to set a certain limit on weights but farmers brought so much pressure to bear that the attempt fizzled. However, some believe the same situation will arise next fall.

146,000 Tank Cars—All Regimented

NPN News Bureau

WASHINGTON — The total number of tank cars now in service in the U. S. is about 146,000, a recent survey showed, with the number in the various services about as follows:

Total number of cars in petroleum service, 120,000. Included in this total are 73,500 in eastern service exclusively, including 9000 in crude service from Norris City (revised figure is about 6250); and 64,500 in other eastern service.

The remaining 92,500 cars are broken down as follows: 36,500 in general petroleum service outside the East; 10,000 in railroad service; chemicals, 14,500; vegetable and edible oils, 6250; army and navy, 2750; alcohol, 1300; wines and miscellaneous, 1200.

A survey by NPN on July 31 showed the following status of all restrictions, including those by PAW, ODT and WPB, applying to use of tank cars:

Restrictions Surveyed

PAW—Movements of kerosine, distillate and residual fuel oils by tank car have been restricted by PAW in telegraphic instructions to suppliers for shipment from Districts 2 or 3 into District 1, as follows:

Dec. 28, 1942, residual fuel oil, kerosine and heating oil, from points west of Mississippi River to points south of Potomac River, including Washington, D. C.; Jan. 3, 1943, kerosine, No. 2 heating oil and residual fuel oil, from Districts 2 and 3 to Florida; Feb. 27, 1943, residual fuel oil, from Tampa and Port Tampa to points north of Savannah, Ga.; Feb. 27, 1943, kerosine, from points outside of District 1 to points south of Potomac River, including Washington, D. C.; March 16, 1943, residual fuel oil, from Corpus Christi, Port Isabel and San Antonio refining areas to District 1; April 6, 1943, No. 2 heating oil for space heating, from points outside of District 1 to points south of Potomac River; April 10, 1943, No. 2 heating oil for space heating, from points in Districts 2 and 3 to District of Columbia, Delaware, and Maryland; April 17, 1943, No. 2 heating oil for space heating, from points in Districts 2 and 3 to Pennsylvania and West Virginia; April 26, 1943, No. 2 heating oil for space heating, from points in Districts 2 and 3 to New York Harbor Terminals of C. N. J. Railroad; July 19, 1943, residual fuel oil from outside District 1 to the Philadelphia supply terminal, including Delaware River points in New Jersey.

Other Limitations

In addition to the telegraphic restrictions listed above, the following PAW orders control tank car movements:

PAO NO. 5—Bans the use of tank cars for delivery of gasoline to the East Coast. Orders provide for appeals which should be filed with Director of Petroleum Supply, PAW, Washington, D. C., Ref.: PAO 5.

DIRECTIVE 65—Divides the 15-state Mid-West area into 26 zones for the distribution of motor fuel, kerosine and distillates, and into 11 zones for distribution of residual fuel oil. Order prohibits inter-area shipment of petroleum products except as approved by the manager and director of petroleum supply acting for the supply and distribution committee in the district. Order does not prohibit shipment from any zone into a county in an adjoining zone to a depth of 10 miles. Order provides for appeal to the district director in charge of District 2 in cases of "exceptional and unreason-

Is good help hard to find?
"Shall I hire older men to take the place of boys who have marched off to war? Can I get a woman to fill Bill's job?" These and other personnel problems are giving many oil jobbers gray hair these days.
How to get the most out of available manpower is but one of the scores of questions Shell is helping solve for its jobbers. Each case is treated individually and recommendations made to fit the circumstances. For no two jobbers have exactly the same problem.
Helping its jobbers with their many and complex problems is not new with Shell. It's a permanent service that is thorough and practical . . . one that has many years of experience behind it. One that Shell Jobbers appreciate.
SHELL
SHELL OIL COMPANY, Incorporated

able hardship". Appellant should set forth the "pertinent facts and reasons" why he considers himself entitled to relief. District director is supposed to render decision within 15 days from which appellant, if he is dissatisfied, may appeal to the Deputy Petroleum Administrator at Washington.

DIRECTIVE NO. 67—Divides the 6-state area of District 3 into 11 zones, plus several "neutral areas" where there are overlapping supply points. Order prohibits inter-area shipments by original suppliers. However, order does not prohibit movement of motor fuel from zones 4, 7, 10 or 11 to any point outside of District 3 or any eastward or north movement of motor fuel between zones 4, 7, 10 or 11; nor does the order prohibit shipment from any zone into an adjacent zone or adjacent "neutral area" to a depth of 10 miles. Order prohibits movement of motor fuel from District 2 to District 3 except to the counties of Benton, Carroll, Boone, Washington, Madison, Newton, Crawford, Sebastian, and Franklin in Arkansas and prohibits tank truck deliveries from river terminals in the immediate vicinity of Memphis, Tenn., into zones 9 and 10. Appeal in case of "exceptional and unreasonable hardship" may be made to the District 3 director in charge. Appellant should set forth the "pertinent facts and reasons" why he considers himself entitled to relief. District director is supposed to render decision within 15 days, from which appellant, if he is dissatisfied, may appeal to the Deputy Petroleum Administrator in Washington.

ODT Schedules Trains

ODT—General Order ODT 7, Revised—Requires that both loaded and empty cars in Eastern service move almost exclusively in "symbol trains", operated on through schedules and ODT-specified through routes. Order limits tank car loading and unloading to 4 hours; requires cars be released within an overall total of 15 hours after they have been delivered; holds carriers, wherever practicable, to 4 hours for switching terminating cars to the plant of the receiver or originating cars to the plant of the shipper; assigns certain tank cars exclusively to eastern petroleum service; requires immediate repair of defective cars by the carriers or their agents without regard to ownership of the cars; requires special or general permit for movement of any commodity in a tank car for a distance of less than 200 miles, as measured by the shortest available published rail tariff route; and requires the participating carrier to assemble and dispatch a symbol train (1) within 10 hours after it has received or been tendered 30 or more cars destined to suitable concentration points, or (2) within 15 hours after there has been tendered to it a train load of cars so destined.

GENERAL ASSIGNMENT ORDER ODT 7, Revised-1—Froze in eastern petroleum service all tank cars operating in that service on or after Dec. 29, 1942. Order provides that cars earmarked for eastern service may be withdrawn only under specific conditions and requirements. They must be replaced immediately with cars of at least equal capacity and the substituted cars must have a capacity of at least 7,000 gallons each. Permission must be obtained from ODT in instances in which no replacements are planned for the withdrawn cars. Order prohibits cars of less than 7,000-gal. capacity, except those assigned by the order, from operating in Eastern service without specific authorization.

SPECIAL DIRECTION ODT 7, Revised 1—Prohibits the use of tank cars for movement of any commodity not included in a list of about 250 products designated by WPB as essential to the war, unless such movements are authorized by ODT.

SPECIAL DIRECTION ODT 7, Revised 2—requires that tank cars be loaded to certain specific standards of capacity, except as specifically allowed by ODT permits.

WPB—General Transportation Order T-1, as amended April 30, establishes controls over use of steel tank cars and tank trucks for delivery of a long list of chemicals.

Shift to Longer Hauls Cuts Tank Car Trips to East

NPN News Bureau

WASHINGTON—Tank car hauls of crude and products to the East Coast dropped to 957,948 b/d during the week ending July 24, from 994,236 b/d the previous week, PAW reported July 28. However, PAW pointed out, this drop was to be expected because cars that formerly hauled oil from the Norris City terminal of the Big Inch pipeline are operating from more distant points, now that the line has been completed all the way to the Atlantic Seaboard.

A total of 56 participating oil companies loaded 31,066 tank cars as follows:

Allied	74	Gulf	3094	Shotmeyer	4
American Bitumuls	28	Hartol	136	Sinclair	1702
Amsco	254	Hess, Inc.	1	Socony-Vacuum	2894
Arkansas Fuel Oil	88	Home Oil	18	Southland	22
Ashland Refining	77	Industrial Oil & Gas Service	3	Southport	148
Asiatic Petroleum	18	Jenny Mnfg. Co.	52	S.O. California	11
Atlantic Refining	2352	Libby Oil	93	S.O. Kentucky	70
James B. Berry Sons	6	Pacific	32	S.O. New Jersey	8258
Chalmette	42	Pan American	1429	S.O. Ohio	118
Cities Service	1010	Petroleum Corp.	175	Sterling	12
Continental	367	Petroleum Heat & Power	9	Sun	2989
Crown Central	12	Phillips	21	Talco	8
Crown Petroleum	8	Premier	10	Texaco	2816
Daugherty	26	Primrose	27	Tide Water	1025
Deblois	6	Pure	73	Tiona	3
Drake	1	Republic	156	Triangle	18
Elk Refining	17	Roosevelt Oil	7	United	14
Freedom Oil	4	Royal Petroleum	76	White	75
Globe	95	Shell	982		

Tankers Take Wing

York (Pa.) Company Asks CAB Permit to Operate Oil-Carrying Airplanes; Proposes Sky Transport of Products to Cover North American Continent

NPN News Bureau

NEW YORK—Postwar plans for commercial aviation, now being formulated in many quarters, are of increasing significance for the petroleum industry. One of the most important was revealed last week with the announcement of the projected "winged tanker".

Coastal Tank Lines, Inc., of York, Pa., made known on July 24 that the Civil Aeronautics Board had accepted and docketed the company's application to operate as a common carrier by aircraft in the transportation of all types of liquid commodities in bulk. The company's engineers have completed plans for a tank for aircraft with all necessary devices for the safe flying of oil and gasoline in large quantities.

H. I. Moul, president and general manager of Coastal Tank Lines, said that the application was for operation in both interstate and foreign commerce under the Civil Aeronautics Act of 1938. The company plans service between any points in the U.S., Canada, Mexico and Alaska. Headquarters will be established at York and plane terminals will be set up as rapidly as trade develops, says Mr. Moul.

Planes to Carry Tanks

While the company now operates a fleet of 175 tank trucks, and maintains 12 terminals in 11 states and the District of Columbia, it as yet owns no aircraft but it has made "adequate inquiry", the CAB application states, and tentative arrangements have been made to obtain planes of the type required. The plan is to equip the aircraft with tank trucks, carried in the body of the plane, and with demountable tanks which may be transferred to specially designed motor chasses at airports and driven to their destinations.

Transportation of aviation gasoline by air is already recognized as sound military tactics. During the Battle for Tunisia it is known that the German army imported virtually all its high-test gasoline by air transport, including the newly developed "air trailers" and powered gliders.

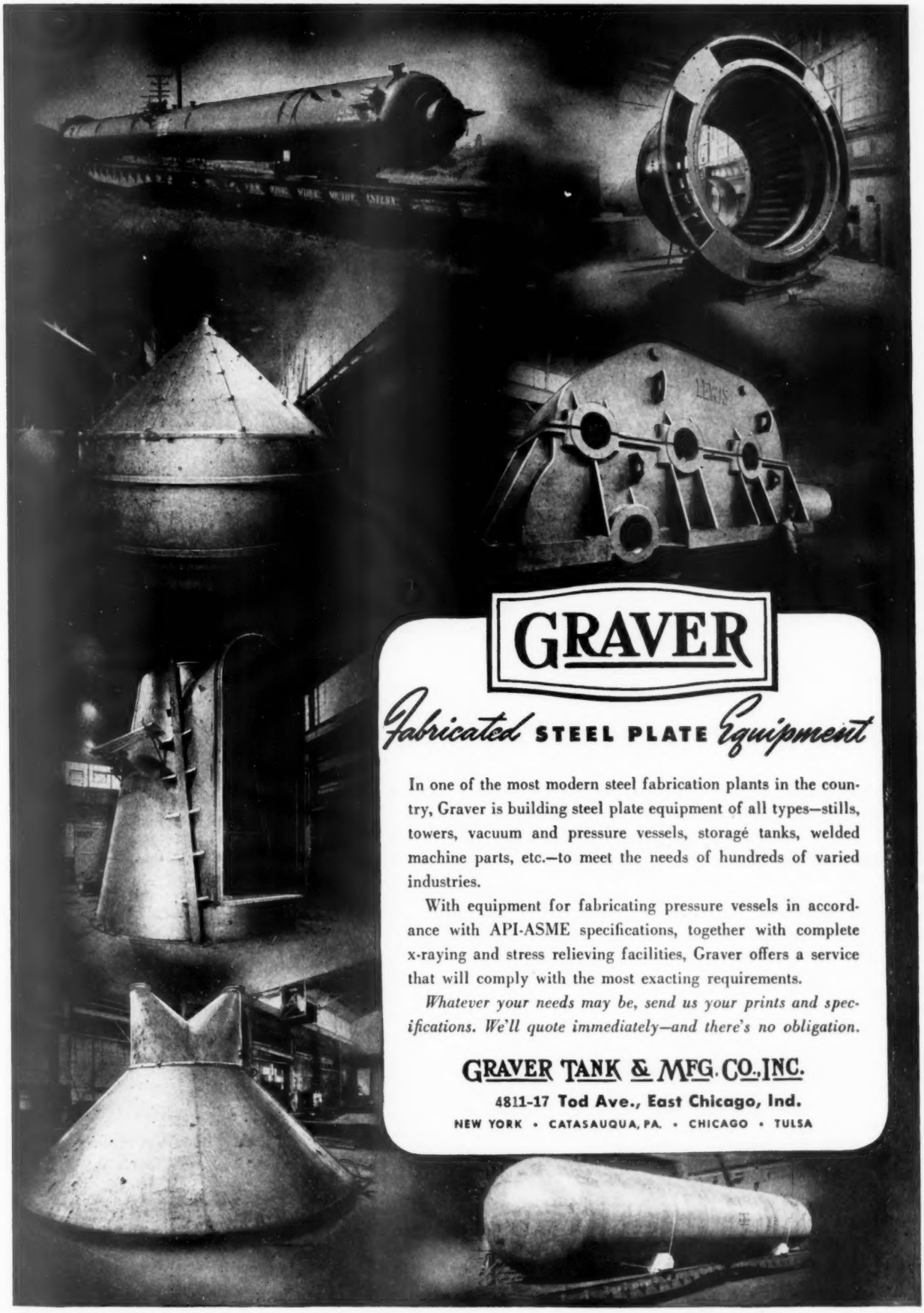
Postwar aviation is, of course most important to the petroleum industry from the standpoint of fuel. A July survey by United Business Service records that one official of a leading automobile firm predicts there will be 5,000,000 planes in this country by 1950.

United Business Service adds: "When it is considered that a Flying Fortress consumed 245 gal. of gasoline per hour and that the trend is toward even larger planes than this, it is easy to imagine the enormous quantities of fuel that will be consumed by commercial air transportation alone when the war is over."

All aviation in the U.S. in 1939 required 161,000,000 gal. of gasoline, and consumption in the early postwar years is expected to be much greater. "This demand will not replace regular demand—it will come on top of it", says United Business Service.

Marine Terminal Opened

One indication of the place of aviation in the future was the opening July 30 of a new


GRAVER
Fabricated STEEL PLATE Equipment
In one of the most modern steel fabrication plants in the country, Graver is building steel plate equipment of all types—stills, towers, vacuum and pressure vessels, storage tanks, welded machine parts, etc.—to meet the needs of hundreds of varied industries.
With equipment for fabricating pressure vessels in accordance with API-ASME specifications, together with complete x-raying and stress relieving facilities, Graver offers a service that will comply with the most exacting requirements.
Whatever your needs may be, send us your prints and specifications. We'll quote immediately—and there's no obligation.
GRAVER TANK & MFG. CO., INC.
4811-17 Tod Ave., East Chicago, Ind.
NEW YORK • CATASAUQUA, PA. • CHICAGO • TULSA

43.B-S

marine terminal at La Guardia Field, New York City, for trans-Atlantic planes, the second trans-ocean air base at this field.

But while America plans for her airways of the future, other nations, too, are active, and keen national rivalry is growing. Last week Viscount Bennett, former Canadian Prime Minister, urged in London that representatives from all the British Empire assemble in immediate conference to map a postwar air commerce policy. Lord Bennett asserted that, unless the empire could hold its own in the air world of the future, "we shall suffer defeat in victory—by winning the war and losing the Empire".

In this country competition for peacetime air lanes is growing keener daily. Several railroads have filed with the CAB for permission to operate plane routes. C. Bedell Munro, president of Pennsylvania-Central Airlines, charged before the Aeronautical Association of Boston two weeks ago that the railroads were "trying to force their way into the air transport field." The railroads reply that operation of planes in passenger and freight service is necessary to meet a new type of postwar competition.

It is the helicopter on which railroads will rely their expansion into air service, said I. B. James, president of the Burlington Transportation Co., subsidiary of the Chicago, Burlington, & Quincy R.R. in his application filed with the CAB in June for permission to operate 6380 miles of air service.

Other transportation companies which have filed for authority to run plane service are the Rio Grande Motorways, Inc., subsidiary of the Denver & Rio Grande R.R., and Greyhound Bus Lines.

Hope Asks FPC for Authority To Build Natural Gas Line

NPN News Bureau

WASHINGTON—Hearing has been set on an application filed June 29 by the Hope Natural Gas Co., Clarksburg, W. Va., for a certificate of public convenience and necessity to construct and operate a 22-in. natural gas pipeline to extend from the company's existing facilities in Kanawha, a distance of about 1140 miles, the Federal Power Commission announced July 19.

The hearing has been set for 9:45 a.m., Aug. 18, in the Commission's hearing room, Hurley-Wright Bldg., Washington, D. C.

The order states, FPC said, that the facilities would include 9 compressor stations, having an initial installed capacity of 68,000 h.p. According to the proposed application, the facilities would be able to deliver 180,000 MCF per day at the eastern end. At 100% load factor, the new line would bring 65,700,000 MCF of gas per year into the Appalachian area and at 90% load factor, 59,130,000 MCF per year.

With additional compressor stations, application pointed out, deliveries would be 240,000 MCF per day; 87,600,000 MCF of gas per year at 100% load factor; 78,840,000 MCF per year at 90% load factor.

FPC's order setting the hearing provides that interested state commissions may participate.

Standard Steel Works on List Of Tank Trailer Makers

In printing a list of the tank and trailer manufacturers who received orders on the new ODT tank truck and tank trailer program for the last two quarters of this year (*NPN July 28, p. 30*), the name of the Standard Steel Works, Kansas City, Mo., was inadvertently given as the "Stainless Steel Works of Kansas City, Mo."

National Petroleum News regrets the error which occurred in trying to make the last form of last week's issue by taking the list of names over the phone from ODT at our Washington News Bureau for transmittal to Cleveland by teletype.

ODT's order is a compliment to the job the tank trucks and trailers have been doing for the oil industry and the country in replacing tank car hauling. It is a list of honor in the field of transportation from which NPN would not want to keep any manufacturer. So will the reader please put the Standard Steel Works of Kansas City, Mo., on his copy of that list.

U. S. Builds 65 Tankers In First Half of '43

NPN News Bureau

NEW YORK — U. S. shipyards delivered 65 tankers of over 1,000,000 deadweight tons in the first six months of 1943, it was announced last week by the board of managers of the American Bureau of Shipping. J. Lewis Luckenbach, bureau president said:

"The addition of the new vessels to the U. S. tanker fleet no doubt ranks us as the largest oil tanker operators in the world. The consummation of the huge tanker building program for the Maritime Commission now under contract will further enhance our position. The pre-war tanker fleet of Norway was sometimes rated as the most modern and probably highest speed large group of tank ships in the world. Some 80% of our pre-war tanker fleet was limited to speeds of 12 knots and under and two-thirds of the vessels were over 20 years of age. The tankers being contracted today are capable of 25% more speed on the average than the pre-war fleet, and have greater carrying capacity."

The 65 new tankers are included in 766 ships with gross tonnage of 5,706,175 and deadweight carrying capacity of 8,458,935 tons which have been built in American yards during the first half of the year. Since Pearl Harbor, said Mr. Luckenbach, more ships have been turned out than the total American flag fleet existing in September, 1939. Of the 65 tankers, about 45 were built by the Maritime Commission itself, the rest by the oil industry. Details of individual size and tonnage of the new tankers are a military secret.

Big Inch Linked Up in Jersey

Special to NPN

RAHWAY, N. J. — Last lengths of the Big Inch pipeline were joined here July 30 when welders sealed the 20-inch segment that branches from Phoenixville, Pa., to New Jersey refineries. Formal completion of Big Inch was marked July 19 in a colorful ceremony at Phoenixville, but since that time crews had been working on the branch lines to Linden and Bayonne, N. J., and Staten Island, N. Y. A few short gaps remain as well as the complex job of terminal piping.

Oil now flowing through the Big Inch from Norris City, Ill., is expected to reach Linden about Aug. 10.

Mileage Allowance Cut Hits Tank Car Firms

NPN News Bureau

CHICAGO—Oil companies and refineries owning tank cars will lose $2,400,000 per year by reason of the reduction in mileage allowances by railroads, a representative of a large tank car operating company estimated July 26. Income of tank car operating companies themselves will be cut $13,600,000, he figured.

The mileage allowance now is 1.50c, but the new tariff, effective August 15, reduces the allowance to 1.25c per mile. The new tariff is temporary, intended to cover the present emergency and will expire December 31, 1944, unless cancelled sooner.

The combined annual income from the present 1.50c rate to oil companies owning their own tank cars and to tank car operating companies, such as Union Tank Car, General American, etc., was placed at $100,000,000. The 16½% reduction will cut the figure to approximately $84,000,000 annually. There are 107,000 tank cars in petroleum service, and on July 1, a total of 74,353 tank cars were carrying products to District 1, transportation sources here said. Tank car operating companies own an estimated 85% of all tank cars in petroleum service and oil companies and refineries the remaining 15%.

It is understood here that the reduction in railroad mileage allowances is a direct result of cancellation of the 6% increase in freight rates recently—but the 16 2/3% cut in allowances is not expected to affect the net earnings of tank car operators in a like amount as there will be a considerable reduction in income taxes by reason of lower gross earnings.

"Tank car earnings are still satisfactory," the operating company representative said, "and unless the average miles traveled per car is reduced by eliminating long hauls from the Southwest, for instance, it is not expected that operating companies will pass the mileage allowance reduction on to oil companies by increasing the lease rental to them."

ODT Check-Up Makes Deep Cuts In Chicago Truck Rations

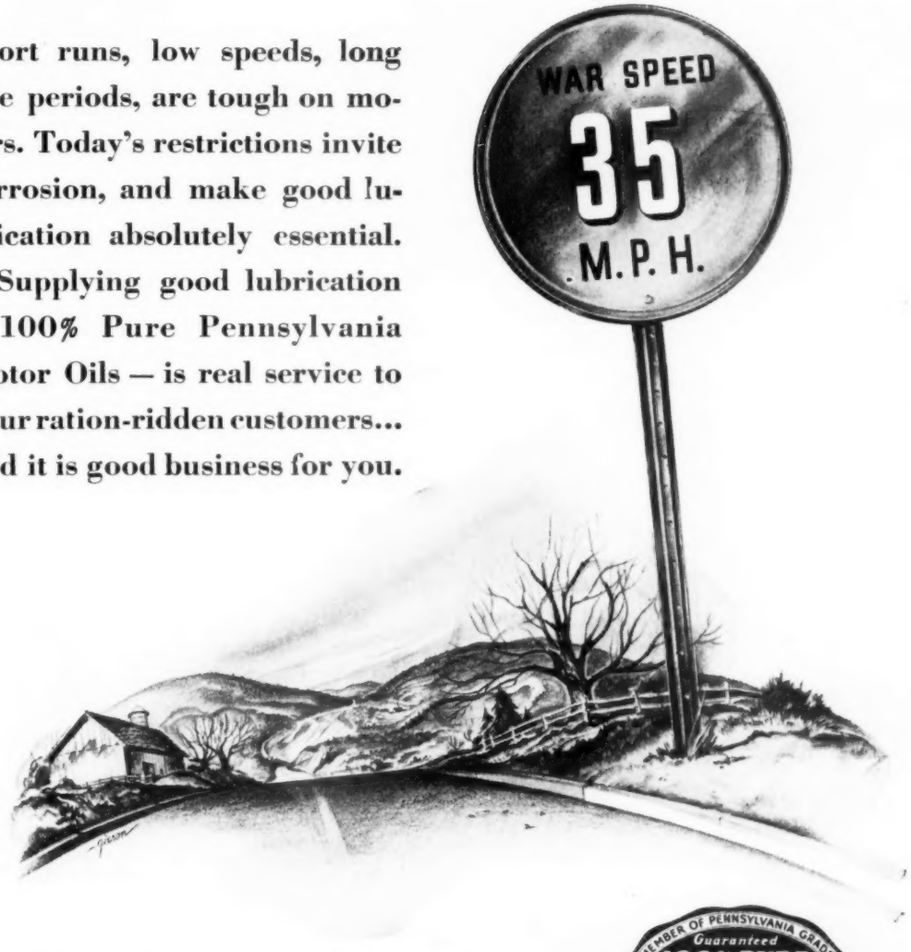
NPN News Bureau

CHICAGO—ODT's check on operations of 58,627 motor truck operators in the Chicago area indicates that 31,128 received excessive allotments of miles and motor fuel, according to a statement made July 27 by Frank Corcoran, ODT Chicago district manager. ODT, he said, has effected a 22,000,000 gal. reduction in gasoline rations covering the second and third quarter as a result of the investigation.

TODAY...

Short runs, low speeds, long idle periods, are tough on motors. Today's restrictions invite corrosion, and make good lubrication absolutely essential.

Supplying good lubrication — 100% Pure Pennsylvania Motor Oils — is real service to your ration-ridden customers... and it is good business for you.



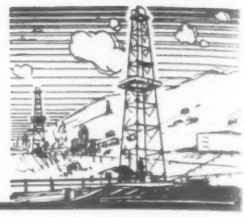
Because of its high quality, war demands great quantities of 100% Pure Pennsylvania Motor Oils and this demand comes first, of course. So there may not be enough to go around. Our region is producing and refining to the limit of its capacity, but war needs are increasing.

MEMBER OF PENNSYLVANIA GRADE
Guaranteed
100% PURE
PENNSYLVANIA
OIL
CRUDE OIL ASSOCIATION
PERMIT NUMBER.....
Made from the highest grade crude oil in the world

COPYRIGHT 1917 U S A BY PENNSYLVANIA GRADE CRUDE OIL ASSOCIATION
TRADEMARK REGISTERED U S PATENT OFFICE

PENNSYLVANIA GRADE CRUDE OIL ASSOCIATION

OIL CITY, PENNSYLVANIA



Crude Demand Still Pointing Up

Daily Average Domestic Requirements for August Estimated by U. S. at 4,151,600 Barrels. Motor Fuel Demand Put at 8% Above Year Ago

NPN News Bureau

WASHINGTON—Daily average supply of domestic crude oil required to meet August market demand was estimated by the U.S. Bureau of Mines at 4,151,600 bbls. on July 30. Total demand for motor fuel in August was estimated at 55,500,000 bbls.—8% higher than actual demand in August a year ago, when sales were abnormally low following inauguration of coupon rationing in the eastern states.

Daily average demand for domestic crude was 3,775,000 bbls. in the first quarter of 1943, Bureau reported, rose sharply to 3,965,000 bbls. in April, showed a small drop to 3,962,000 bbls. in May, and rose to about 4,100,000 bbls. according to current figures available for June. It may exceed 4,150,000 bbls. daily in July.

The recent sharp rise in refinery operations, the Bureau observed, reflects the recovery of pipeline movements from the effects of May floods, the anticipation of larger overland oil movements due to completion of the Big Inch pipeline all the way to the East, a continued heavy liquidation of crude stocks and an upward trend in crude production.

"Further increases in crude demand," the Bureau said, "will depend primarily upon the extent to which crude production can be expanded and on a substantial gain in boat movements of either crude or products.

Maps Possible Movements

"An increase in available tankers would involve several alternatives with varying effects on domestic crude demand and refinery operations. Larger shipments of refined products from the Gulf ports to the East Coast, or to meet requirements abroad, would involve an increase in domestic crude production and in Gulf Coast refinery operations, whereas if more crude was shipped from the Gulf, it would step up refinery operations in the East Coast.

"An increase in the movement of products, particularly fuel oils, from Caribbean refineries to the East Coast, or to meet war requirements abroad, would reduce further gains in domestic crude production and runs, whereas larger crude imports would increase operations in coastal refineries without having to draw on domestic crude."

The Bureau estimated a drop of 2,700,000 bbls. in finished gasoline stocks during August, compared with a drop of 254,000 bbls. a year ago. Finished and unfinished stock totaled 83,887,000 bbls. on May 31.

Statistics of A.P.I. indicate that gasoline inventories dropped about 4,500,000 bbls. during June, putting them at approximately 79,400,000 bbls. on June 30. This compares with 87,517,000 bbls. on June 30, 1942.

Percentage yield of gasoline from crude during August was estimated at 37.70%, compared with 38.00% for July, and 39.06% in August, 1942. Crude oil for export and to be used as fuel and losses was estimated at 7,000,000 bbls.

Following is summary of forecasts by the Bureau for August (figures in bbls.):

	Forecast August 1943	Forecast July 1943	Actual August 1942
DEMAND FOR MOTOR FUEL*			
Domestic demand	.....	.....	.....
Exports	.....	.....	.....
Total demand	55,500,000	54,300,000	51,542,000
SUPPLY OF MOTOR FUEL:			
Straight-run and cracked gasoline production	46,030,000	45,110,000	44,579,000
Natural gasoline used at refineries	5,170,000	4,990,000	4,909,000
Total refinery production	51,200,000	50,100,000	49,488,000
Other natural gasoline and imports	1,600,000	1,700,000	1,800,000
Decrease in finished stocks	2,700,000	2,500,000	254,000
Available supply	55,500,000	54,300,000	51,542,000
CRUDE-OIL REQUIREMENTS:			
Percent yield of gasoline from crude	37.70	38.00	39.06
Refinery crude required	122,100,000	118,700,000	114,135,000
Daily average	3,938,700	3,829,000	3,681,800
Domestic crude runs	121,700,000	118,400,000	113,923,000
Exports	}		
Fuel and losses	} 7,000,000	6,800,000	7,731,000
Total demand for domestic crude	128,700,000	125,200,000	121,654,000
Daily average	4,151,600	4,038,700	3,924,300
Decrease in domestic stocks	.....	.....	1,225,000
Actual production	.....	.....	120,429,000
Daily average	.....	.....	3,884,800

* The term "Motor Fuel" as used in this report includes gasoline and naphtha used for all purposes, but does not include heavier distillates used in the operation of tractors or burned in Diesel engines.

Distillate Well Group Puts High Hopes In Houston Research

NPN News Bureau

TULSA—A broad program of research concerned with some of the complex problems in distillate well production is to get under way about Aug. 9 in the Katy gas field unit near Houston. Sponsored by the Natural Gasoline Assn. of America, it is a cooperative project in which a large number of oil companies having distillate interests are participating.

J. W. Vaiden, Skelly Oil Co., Tulsa, and N.G.A.A. president, said the usual approach to these problems through committee work had to be set aside temporarily because of manpower shortage and transportation handicaps. Accordingly, the association has retained Drs. G. G. Brown and D. L. Katz, University of Michigan, with several of their assistants, to conduct field studies. The results are expected to be of great importance to the distillate industry.

Principal objective of the tests is a simple and practical method of sampling a 2-phase gas stream. Experiments are to be made with various types of equipment through a pressure range of 1000-2000 lbs. per sq. in. on streams containing up to about 10% liquid phase by volume. Other experiments are to be made with new methods for determining specific gravity and liquid content of such gases. Elaborate full-scale equipment is being set up at the No. 9 well of the Katy unit under the immediate supervision of W. A. Van Hook and Carl J. Mantzell, Stanolind Oil & Gas Co.

General plan of the project and the testing layout is the work of C. R. Williams, Chicago Corp., vice-president of the N.G.A.A. high pressure gas division; R. J. Sullivan, Humble Oil & Refining Co.; M. R. Church, Shell Oil Co.; W. L. Bowser, Atlantic Refining Co.; J. R. Butler, Cotton Valley Operators Committee; and D. A. Sillers, Lone Star Gas Co.

Louisiana Allowables Increased

Special to NPN

BATON ROUGE — Louisiana August crude production allowable has been set at 277,969 b/d for South Louisiana fields and 80,898 b/d for North Louisiana, a total of 358,867 b/d compared with 354,791 b/d in July, according to order of Department of Conservation.

Total allocated for petroleum liquids other than crude oil amounted to 27,000 b/d. PAW recommended 356,300 b/d for August, or 2567 b/d less than commission set. However, commission estimated there would be 30,000 b/d of underproduction and 6000 b/d produced by new wells and through work-overs of existing wells.

Commission announced public hearing to set allowables for 61-day period of September-October will be held in New Orleans' Monteleone Hotel Aug. 17.

NLRB REPORT HITS STRIKERS

(*Continued from page* 8)

each of the discharged strikers. When this review was held the strikers entered a plea of "not guilty", but made no further statement in their defense, because the company would not accede to the union's demand that final judgment should be participated in by the union.

After reciting the facts as found by the board as to the seizure of the company's property, etc., the board said:

"In view of the above finding, it follows that if the respondents discharged the employes named in the complaint for the sole reason that they engaged in a sitdown strike and seized the respondents' property, the complaint as to these employes must be dismissed. There is no substantial evidence in the record that the respondents were otherwise motivated. (General Counsel) Denton's letter, (of discharge) which formed the basis for the respondents' investigation and the manner in which the investigation was conducted, together with the absence of any substantial evidence prior to the discharge of anti-union activities of the respondents, convinces us that the respondents honestly endeavored to rid themselves only of those employes who had taken possession of the respondents' property. No striker, the investigation concerning whom indicated that he had merely left the respondents' property and engaged in peaceful picketing, was discharged. A majority of the strikers were in this category.

Calls Method 'Objective'

"The tests imposed by the respondents in separating those of its striking employes who left the plant from those who participated in its seizure, appear to us to have been fairly conceived and objectively applied . . . .

"In the application of those tests it was recognized that some mistakes might be made and that some employes might be included among those selected for discharge who engaged only in permissible strike activities. To correct such possible instances of error the respondents, we believe in good faith, offered in the discharge letters to review the case of any employe who felt that he was wrongfully discharged. As we have found, no discharged employe availed himself of the opportunity thus afforded until after the hearing had begun, and then only to the extent of 'not guilty'.

"While the decision to discharge certain strikers appears arbitrary when contrasted with the decision to keep certain others, we do not find in any instance that the decision to discharge (certain of them) was discriminatorily made because of union membership or activity.

"On the basis of the facts set forth above and the record as a whole, we find that the respondents discharged the employes named in the complaint because they engaged in a sitdown strike and seized the respondents' property, and not because of their union membership or legitimate activity . . . ."

No Evidence of Bribery

The union charged that one of their number had been bribed by an investigator employed by the company, but the board held that there was no evidence of attempted entrapment by the company, and that evidently only the union profited by the alleged sellout of its members.

The board reviewed the activities of the police commissioner of the City of Tulsa and of the colonel in command of the Oklahoma National Guard, who installed dictaphones in the union's headquarters at the Tulsa Hotel. The money for this work was obtained by these officers from the vice-president of the Mid-Continent refinery. It was not disclosed that he knew just what was done with the money or had anything to do with its payment. All of this was carried on by these two police officers.

At several places in the opinion the board is critical of the rulings made by its trial examiner, Theo R. Bland, who had been assigned to the case by the chief trial examiner. The board said that at least many of the rulings constituted error, but as it found wholly for the company it was not necessary to go into details on some of them.

Cites Trial Examiner's Errors

For instance, the board said that the trial examiner would not let the Mid-Continent's witnesses testify that they were "pursued, stoned, threatened with being beaten, menaced with clubs or otherwise intimidated or prevented from entering the refinery by pickets, unless the witnesses were able to identify the pickets by name. The objections of board's counsel to such testimony were based on the contention that the discharge of one employe could not be justified by reason of the acts of other and unnamed employes. This contention overlooked the nature of the respondents' defense, which was that the employes named in the complaint were discharged because they engaged in a sitdown strike and seized the respondents' property. The trial examiner, by sustaining these objections, thereby denied the respondents a full opportunity to establish the fact of a sitdown strike, the concomitants of which, in addition to the occupancy of the employer's property, are frequently violence and denial of ingress to and egress from the place of work.

"A typical instance of the difficulties imposed upon the respondents by the rulings of the trial examiner is found in his striking the testimony of several members of a railroad train crew, who testified that they were prevented from taking a freight car of food into the refinery by pickets who stood on the tracks, because the witnesses could not identify the pickets by name.

"We have found above that the respondents flew food into the refinery by airplane. Evidence to this effect loses much of its significance when the circumstances which necessitated it are not permitted to be shown."

Another Instance Given

Another instance of error by the trial examiner was when he refused to let the chief engineer of the refinery give his opinion from much technical data admitted as to whether the refinery was closed down "in a normal and proper manner".

Still another instance cited of the union bias of the trial examiner was when the police commissioner of Tulsa refused to give up the records of alleged union conversations in union headquarters obtained by the police through the hidden dictaphone, except under court order. When such an order was obtained from the Federal District Court the board's attorney selected such pages as he wished and handed the remainder back to the police commissioner, with the injunction that no one was to see them and that the protection given the commissioner by the court order did not apply to the pages not wished by the board's attorney and the examiner.

The examiner refused to admit into the evidence any pages of these conversations not approved by the board's attorney. As to this ruling the board said:

"By these rulings the trial examiner barred the respondents from effectively presenting their defense, and thereby denied them a fair hearing."

HERE'S HELP!

Help to get your daily mail out faster.

Help to get your long distance calls through quicker.

Platt's War-Oil Directory is that "help."

It has all those names you need for your daily correspondence.

It has all the correct addresses of the men you write to—their titles, too.

And it has the long distance numbers of the men you daily call.

3486 Individual Names, Addresses and Phone Numbers of oil and government men serving in the nation's war-oil program.

274 war agency and oil organization names, addresses and phone numbers.

Send for "HELP" today . . . . through PLATT'S WAR - OIL DIRECTORY—Second Edition.

Platt's

WAR-OIL DIRECTORY

SECOND EDITION

★

PRICES

25 and over	$1.90 each
10 to 24	1.95 each
Single Copy	2.25 each

Platt's War-Oil Communication Services,
1213 West Third Street, Cleveland 13, Ohio 8443

Ship me_____copies "PLATT'S WAR-OIL DIRECTORY" right away. Check is attached for $_____

Name_____

Company_____

Address_____

City-State_____

Stations Go on Auction Block

Sinclair Disposes of Unwanted Outlets at 'August Clearance'

THE Chant of a peppy little Irish auctioneer in Cleveland's ritzy Statler Hotel ballroom last Saturday made Sinclair Refining Co. the nation's first conductor of a July clearance sale of surplus service stations and sites.

A total of $36,900 was obtained by a national auctioneering firm for 13 pieces of property in greater Cleveland owned by Sinclair since the early twenties. This was less than half of the 1942 valuation. But it eliminated for Sinclair some $2000 yearly taxes on unproductive property. Charging off the book value of this property won't hurt the company's 1943 financial statement either. That is, if it accepts the offers in 10 days, which right Sinclair reserved. Chances are Sinclair will. This is only a small portion of the company's Cleveland holdings, and the properties sold did not fit in with its present or postwar plans.

Buyer Takes All—Almost

The bidding was lively. More than 75 oil men, brokers and speculators were present. Properties put on the block included 3 going stations, 2 bulk and storage plant sites, 1 vacant business corner and 9 closed stations. No equipment or personal property was included. The purchaser got the grounds, tanks, pipings, buildings, driveways and permanent fixtures. No lifts, pumps or dispensing equipment was included.

The bidding started at $500 on the first parcel. This was a going station in a foreign neighborhood with a gallonage of about 10,000 a month. It was assessed at $4010. A total of 12 bids were recorded before the stucco-on-brick station, with three 1000-gal. tanks, was knocked down to R. E. Murray, Atlantic jobber, for $3300.

2 Hours Running Time

In a little less than 2 hours the entire offering had been disposed of. Bidders made a 10% cash deposit on each parcel. They also paid a $25 auctioneers' "knock-down fee". They had signed papers agreeing to pay the balance of their bid in 30 days.

"This method of disposing of surplus property would have saved my company many thousands of dollars in negotiating private sales of 'cat and dog property,'" one oil company executive remarked.

But most of this batch of oil company property did not rate in the lemon class with independent oil marketers. At least 5 of the parcels were bought by independent marketers whose records definitely prove that they know their way around. E. C. Sadler of the Texas Distributing Co., one of northern Ohio's largest independents, outbid some 20 offers for a stucco station on a business corner. This station was on an 80 x 80 ft. plot. It was assessed for $5300, and the final bid was $5500. Another 2 bay, 1-toilet, brick-and-stucco station building, on an irregular plot 99 x 64 ft., went to Mr. Sadler for $5500.

Jobber Buys 3 Parcels

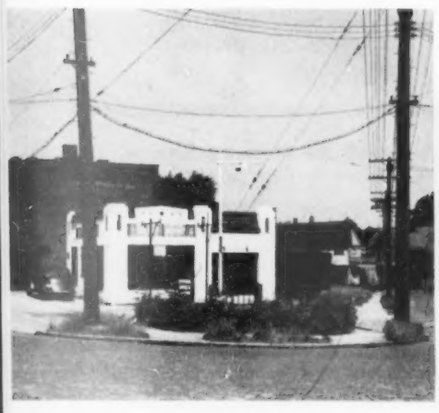
Another independent jobber, General Oil and Gasoline Co., became the owner of 3 parcels. One was a vacant corner, assessed for $2180. It was knocked down for $400. Another small stucco-and-brick station on an irregular lot 130 x 49, assessed $2220, was bought by this firm for $1500. Included were three 1000-gal. tanks and piping. A third station went to this jobber for $2100. This station, on a 103 x 91 ft. lot, was assessed at $4090.

But all of the property did not go to jobbers who figured they could do a better job with the stations than the major company.

There was Sam Roth.

Sam had little to say about himself. He let a bankroll of a few thousand dollars do his talking. He may have been a defense worker. Anyhow he dropped the word that some day he expected to have a string of stations. He bid on nearly every parcel offered, after first consulting his wife. The tally sheet showed that "Mom and Pop", as the auctioneer called the couple, bought 2 stations for a total of $5100. One was on an 89 x 65 ft. lot, assessed at $5210, which was bid in for $3100. The other was a small, 1-toilet station, on a plot 102 x 109 ft., assessed at $3450, which was picked up for $2000.

Another site in a Cleveland suburb, 60 x 140



$2000

$3600

$2000

$2000

$3100 $3300 $400 $5500

ft., containing a 30 x 60 metal garage, went to a coal man for $900.

The height of something was reached when an elderly gentleman bought a stucco brick station for $2000. This outlet, on a 79 x 65 ft. lot, was assessed at $3650. It originally was sold to Sinclair 22 years ago for more than twice that amount, *by the gentleman who made the purchase.*

There was a touch of pathos during the auction when a badly crippled young man, evidently the operator of one of the stations, bid his few hundred dollars on a location which went for more than $4000. And there was fun, too, as confused bidders occasionally upped their own bid.

An industrial site of over 2 acres, with 1200 ft. of sidetrack included, went to a private individual at a price of $5000. "Merely for speculation," he said. But those in the know asserted that he had bought this piece of property, assessed at $19,420, for the city of Lakewood, a Cleveland suburb.

Attorney Hubert Fuller, who 2 decades ago bought most of this property for Sinclair, almost went through the floor when an irregular business triangle plot, 155 x 20 ft., assessed at $8120 and costing many times that amount, went for a mere $3600 to a real estate broker.

Another broker picked up a stucco-on-brick station with three 1000-gal. underground tanks, assessed at $4430, for $2000.

Sinclair Clears Decks

When the auctioneer's last intonation had echoed through the hall, everyone seemed happy over the results of the country's first big station casualty auction sale. Sinclair had cleared its decks for postwar operations. Local company officials were rid of a lot of headaches. Independent jobbers had strengthened their own operating positions, and the speculators felt that things looked good after the war.

In deciding which property was to be sold, Sinclair officials used a lot of horse sense and very little formula. The local district manager, G. J. Spellman, after many years of management in the Cleveland district, knew his properties and his sales figures and had little trouble in recommending those that he thought should be disposed of.

A little broader picture was obtained by state manager R. L. Taylor, who made his recommendations.

A still broader picture was obtained by home office executives. These recommendations, all analyzed by Sinclair's real estate and marketing specialists, familiar with future plans of the company, resulted in the decision of which properties should be retained and which should be sold.

Was Auctioneer's Idea

The decision to try out the auction plan of disposing of surplus property instead of privately, as some companies are doing, was occasioned by the approach of the national auctioneering company with its proposition of conducting sales on a percentage and fee basis. This company had previously conducted a successful sale for Socony-Vacuum Oil Co., Inc., disposing of a number of abandoned stations for Socony in the East. Most of these were adjacent to operating stations.

The plan of the auctioneering company, in addition to the services of professional auctioneers, includes a variety of sales promotion plans. Outdoor signs are used, as well as book maps, personal promotion, personal letters and telegrams to prospective bidders, publicity in newspapers, and other tried methods.

The auctioneering company is now working on a plan for holding auctions nationally, to dispose of surplus oil company property. It is already negotiating with several companies for sales similar to the one held in Cleveland. The company has plans for a pooling arrangement in some of the cities, all of the oil companies throwing their surplus property into one pool. It is that auctioneer's idea that such property can be disposed of quickly, and less expensively, than by individual sales.

In Cleveland, stations are now being utilized for many purposes. Large dry cleaning establishments are leasing the properties as branch collection and distributing agencies. Others are being used for flower stands, paint shops, fruit markets, paint establishments, real estate offices, and other purposes.

Super de Luxe Stations Forecast for Postwar Era

NPN News Bureau

CLEVELAND— A prediction that 60% of the nation's gasoline filling stations will be washed out before the war is over is made by Raymond Shaw, president of the Chek-Chart Corp., Chicago, writing in *Ethyl News*, publication of Ethyl Corp.

He sees the war remaking the service station business and predicts that in the postwar world the super station, accenting lubrication, accessories, repairs, and not merely fuel, will dominate the field.

The superstations probably will be manned by technicians trained in the armed forces, he says.

Sees Big Maintenance Problem

He thinks that after the war auto manufacturers will resume production of 1942 models but points out that there still will be millions of old cars on the road which will tax the ingenuity of the technicians to keep in service.

"These old cars will need tires, batteries, and accessories in a volume never known before, so postwar servicing will have to be geared to satisfy the needs of older cars as well as those of newer models.

"Automobile engineers will take advantage of the excellent fuel and the lubricants that will be available to produce more powerful, more economical engines. The public will quickly regain its appetite to go places and do things on wheels."

The "gas station" has been giving way during the past decade to the super or one-stop type of station, Mr. Shaw explains. "The wisdom of this transformation has become apparent since the war, for the stations pulling through are those that diversified their income through the sale of lubrication service, tires, batteries, accessories, car washing, and some mechanical servicing.

New Cars Need Few Repairs

"Oil company executives are realizing that a goodly portion of their profits, and those of their dealers, on civilian business is coming from the tire, battery, accessory, and lubrication departments.

"Automobiles have been so improved that there are fewer and fewer repair jobs. Repairing today consists mainly of adjusting and replacing parts that gradually wear. This type of repair service can be offered by the super-type stations.

"I believe that the evolution toward a complete service outlet will find the larger stations offering medium repair services such as replacement of engine accessories, and motor tune-up, while even the smaller outlets will offer services that can be performed with a monkey wrench, a pair of pliers, and a screw driver. In fact, these smaller outlets could become 'feeders' to larger stations on medium repair work.

"A lot of mechanically trained men will be required for these outlets in order to provide the type of lubrication and mechanical services that will be demanded. What better place is there to seek men than among those now in service?"

Report Declares Joint Use of Bulk Plants Would Save Little in District 4

—Joint use of bulk plants would not conserve manpower, truck miles or marketing facilities in District 4.

—Likewise no manpower would be saved by the arbitrary closing of service stations.

—District 4's problem of streamlining its marketing operations can best be solved by increasing the internal efficiency of the district's individual marketing units.

Those are the conclusions of the District 4 joint use of marketing facilities committee, headed by J. A. Lentz, vice-president of Continental Oil Co., Denver, Colo., as reported to PAW.

Reasons for the committee's conclusions seem almost apparent from a cursory study of the district's geographic and economic peculiarities alone.

Sprawling over 17.1% of the total area of the U. S., the district, which includes Colorado, Idaho, Montana and Wyoming, has only 2.3% of the nation's population. Population per square mile in District 4 is 5.8 while the U. S. average is 43.6.

Distances between centers of population in District 4 are great; roads are none too good. Agriculture, ranging from dry to intensely irrigated farming; mining; lumbering; and livestock raising are the principal activities. The district also has a substantial tourist business. These factors, plus wide variations in temperature, cause deep highs and lows in seasonal demands for petroleum products. Farm demand is more intense than in most areas because of the shortness of the farming season. Demand for heating oils isn't sufficient in the winter to offset the seasonal decline from heavy demands of the summer.

Large Terminals Lacking

There are no product pipelines in District 4; neither is there water transportation. Thus there are no large terminals. Each state has one or more refineries, generally located in the larger cities (there are only 53 cities of over 5000 population). Bulk plants are likewise concentrated in the larger cities.

Refineries in Colorado, Utah and Idaho are not large enough to supply all the needs of those states. Excess demand is met by Montana and Wyoming refineries to some extent.

Mountains and other rough terrain in District 4 require the use of small bulk plants in many small towns where this would not be justified normally; these hamlets would be supplied by deliveries from larger cities and the small bulk plants by-passed except for the geographic conditions encountered.

Exchange of Products Stepped Up

Before the war, District 4 refiners, because of the great distances involved, had found it advantageous to exchange products. Since the war such exchanges have been stepped up. In April of this year, about 16% of District 4's total gasoline gallonage was being exchanged and constant effort has been and is being made to improve this figure, according to the joint use committee. Shipments of products within the district and between District 4 and other districts have been carefully studied and most cross-hauls eliminated, the committee said.

Summing up its conclusions regarding bulk plants, the committee said:

"This committee concluded that joint use of bulk plant facilities is not practical nor does such a plan offer sufficient advantages under any circumstances that can now be foreseen to warrant such a drastic move. Our conclusions apply to metropolitan as well as rural areas. We are agreed that if the time ever comes when our armed forces actually need the storage tanks, pipelines, pumping equipment, etc., for use in the U. S. A. or foreign lands, then further consideration could be given for abandoning of bulk plants and the moving of such facilities to locations wherever needed. The basic reasons leading us to this conclusion are enumerated herewith:

"1—Bulk plants are generally concentrated in a segregated area and hence no advantage from a mileage-saving standpoint accrues to any single or group of bulk plants. Surveys made in the two largest cities in District 4 (Denver and Salt Lake) indicate that this is even true in these two metropolitan areas.

"2—Surveys indicate that bulk plants in smaller communities are generally one-man operated, with the use of perhaps an additional part-time truck driver during the busy farming season. Joint use would result in little, if any, savings at plants of this type.

Efficiency of Method Proved

"3—With the exception of a few larger cities, where plants are operated on a strictly supervised salary basis, proctically all other bulk plants are either operated on a commission or individual ownership basis. This method has proven its efficiency throughout the years inasmuch as such operators are dependent upon profits earned through minimum expenditures of manpower and transportation. We are convinced that this method represents a minimum of waste and any amount of arbitrary realignment would not result in appreciable savings.

"4—Lubricating oil, greases, and specialty products are generally delivered by means of can racks and package compartments attached to light oil tank trucks. Deliveries are usually made when light oil products are dumped. In case of joint use of bulk plants, this method could not be continued because of the more numerous brands and qualities of oils and greases in relation to light oils being distributed and demanded by the buying public. Only a complete elimination of brands and qualities would permit this method of delivery to continue under joint use and we concluded that the time has not yet arrived to either deny the buyer his right to choose what to buy or force many successful distributors out of businesses built up by means of brands and individual efforts.

"6—Surveys clearly indicate that in serving dealers and consumers in urban communities, joint use of facilities promises only negligible savings. Bulk plant locations do not differ sufficiently to give one a mileage advantage over any other when serving this kind of trade.

"6—Joint use of facilities could effect mileage savings in deliveries to farmers or suburban dealers and consumers only if areas were zoned and customers frozen to individual bulk plants and brands. Even then, many so-called savings are more apparent than real on account of the farmer's lack of flexible storage which is now more serious than ever because of iron drum shortages, variation in seasonal requirements, number of products required and their different rate of consumption. Furthermore, as long as trucks of various distributors leave their plants fully loaded and return empty, no waste of transportation and manpower occurs as compared to a joint operation, and surely the farmer, who is experiencing multiplied troubles of his own during this period, is still entitled to his choice of products and at least some voice, consistent with efficient truck operations, as to who should make the deliveries and when.

No Saving on Manpower

"7—Experimental organization charts indicated that possible savings in actual joint use of facilities, as far as operating personnel were concerned, were largely offset by additional employes being required for accounting, auditing, and supervising such joint operations. Only common ownership or complete monopoly would tend to bring about 'field' savings of any consequence, but a change to this system would require such a large governmental overhead of manpower to administer, that savings would probably not be realized but indeed actual waste of manpower might occur.

"8—District 4 is mostly rural in character. Studies show that the cheapest operation is a rail or truck transport haul from refineries to bulk plants and then the use of smaller trucks in making the ultimate deliveries to the dealer or consumer. This method is universally in effect and joint use of bulk plants would not increase effectiveness.

"9—Many bulk plants (built principally in horse-drawn days) have been closed and this process of elimination is going on at an accelerated rate since Pearl Harbor. One company operating in District 4 reports having closed 172 bulk plants during the past few years. Many of the tanks have been sold to the armed forces and other governmental agencies. Other companies report proportionate bulk plant abandonments. It is fallacious to assume that progress effecting savings in distribution has been at a standstill. Necessity intensified by war, will force closing of additional plants, perhaps at a faster rate than desirable, and it appears that notwithstanding all kinds of planning, many communities will be without active bulk plant facilities needed to take care of essential civilian and agricultural de-

mand. It requires little imagination to realize that such abandonments will in the end require greater expenditure of mileage and manpower to provide only essential service from other points.

"10—This committee believes that if all or the greater part of its recommendations are approved and put in effect, some by PAW directives or orders and others by PAW permissives, from 60% to 70% of any possible maximum savings which might be accomplished by further so-called socialization or regimentation would be out of proportion and are not warranted at this time."

Calls Term a Misnomer

As far as service stations in District 4 are concerned, the committee declared the term "joint use of service station" is a misnomer. "There can be no practical joint use of service station facilities," the committee said.

"Retail outlets must either remain open for business or close, and since by far the greatest majority are individually owned or operated, practically each unit presents a specialized problem. It is our feeling that dislocations caused by war are forcing retail outlets to close at a faster rate than even now appears desirable. The time may soon come when this committee may be requested to devote part of its efforts to reopening additional retail outlets to aid in preserving America's vital and diminishing supply of motor equipment, and furnish such other numerous services as are now being required by various governmental agencies, such as OPA and ODT."

About 25% of the service stations in District 4 are already closed. Decreased demand due to gasoline rationing is accelerating the rate of closings, the committee said.

Recommending continuance of limitations on hours of gasoline sales and retail credit, the committee declared these limitations have been consistently favored by it in the belief that they afford substantial manpower savings.

Hits Free Servicing of Oil Burners

Limitations on the number of brands of lubricating oils and greases to be marketed should be avoided and all free servicing of domestic oil burners by fuel oil distributors should be discontinued, the committee said in summing up its recommendations for improving efficiency of bulk plants.

Also, consideration should be given to the issuance of a "permissive" whereby competitive distributors may voluntarily trade accounts or turn over accounts to other distributors to service without making a trade, the committee said. The committee strongly believes that tank truck speed limit should be raised from 35 m.p.h. to 45 m.p.h. and that PAW should urge all distributors to establish "prices at which bona fide competitors could purchase products for which they themselves do not have bulk storage." These prices, the committee said, could be either on a delivery cost plus or so much over the tank truck price. "It is believed that many distributors if given a reasonable price basis, would buy products not stored in bulk, from a competitor rather than drive to a neighboring bulk plant for such supplies," the committee said.

One of the most novel of the committee's suggestions was the issuance of a "permissive" by PAW under which a bulk plant agent "could represent more than one company." This, said the committee, would save manpower and avoid cross-hauls when a competitor loses an agent and a new one is not available for employment.

Finally, the committee recommended steps be taken to increase storage facilities of farmers, permitting larger dumps and more efficient truck routing.

Studied by joint use survey committees in District 4 were these areas: Denver and Logan counties in Colorado; Ada Boise and Twin Falls counties in Idaho; Silver Bow (Butte) and Yellowstone (Billings) counties in Montana; Salt Lake and Cache counties in Utah; Natrona (Casper) and Washakie counties in Wyoming.

Seaside Branch Gets 'T' Flag

Special to NPN

SAN FRANCISCO — Employes of the local office of the Seaside Oil Co. recently were awarded the Treasury Department's "T" Flag after they had signed up on the payroll allotment plan for the purchase of United States War Bonds for gross deductions equivalent to 10% of the district's payroll.

The presentation was made by Robert P. Ettienne, treasury representative, and C. A. Rossow, Seaside's San Francisco district sales manager, accepted on behalf of employes. Seaside's offices in Los Angeles, Sacramento, Riverside and Fresno also have received "T" Flags.

COMING MEETINGS

SEPTEMBER

Empire State Petroleum Assn., Inc., Fall meeting, Hotel Commodore, New York, N. Y., Wed.-Thurs., Sept. 15-16.

National Petroleum Assn., 41st annual meeting, Waldorf-Astoria, New York, N. Y., Tues.-Wed., Sept. 21-22.

OCTOBER

West Virginia Petroleum Assn., Annual Convention Daniel Boone Hotel, Charleston, W. Va., Wed., Oct. 13.

Indiana Independent Petroleum Assn., Inc., Hotel Severin, Indianapolis, Ind., Wed., Thurs., Oct. 13-14.

Mid-Continent Oil & Gas Assn., annual meeting, Blackstone Hotel, Ft. Worth, Tex., Thurs.-Fri., Oct. 14-15.

Petroleum Division, National Assn. of Credit Men, St. Louis, Mo., Mon.-Wed., Oct. 25-26-27.

Independent Petroleum Assn. of America, 14th annual meeting, Blackstone Hotel, Fort Worth, Tex., Mon.-Wed., Oct. 25-27.

NOVEMBER

National Lubricating Grease Institute, annual meeting, Edgewater Beach Hotel, Chicago, Ill., Mon.-Wed., Nov. 1-2-3.

Ohio Petroleum Marketers Assn. Inc., annual meeting, Hotel Deshler-Wallick, Columbus, O., Wed.-Thurs., Nov. 3-4.

American Petroleum Institute, 24th annual meeting, Palmer House, Chicago, Ill., Mon. Thurs., Nov. 8-11.

The American Society of Mechanical Engineers, New York, Mon.-Fri., Nov. 29-30, Dec. 1-2-3.

South Dakota Independent Oil Men's Assn., annual meeting, Marvin Hughitt Hotel, Huron, S. D., Mon.-Tues., Nov. 29-30.

BLACKMER ROTARY HAND PUMPS

SELF-ADJUSTING FOR WEAR
SELF PRIMING

Made in 54 standard models.
7 to 25 GPM.

SERVING THE PETROLEUM INDUSTRY FOR 40 YEARS

Blackmer Bucket Design (swinging vane principle) makes these pumps self-adjusting for wear. 20 years constant service is not unusual.

Easy to operate. Self-priming. 20-ft. suction lift without a foot valve. Note open-end view at left showing arrangement of "Buckets".

Barrel Unit complete with spout, suction pipe and bung attachment.

Write for Bulletin 205 — Rotary Hand Pumps

BLACKMER PUMP COMPANY
1888 Century Ave. Grand Rapids 9, Mich.

Barrel Unit with drip-pan and shut-off spout.

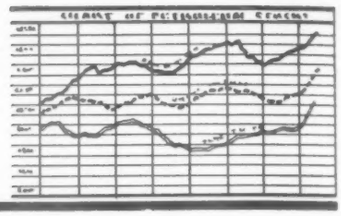
Refueling unit—underground storage.

Refueling unit. Barrel or tank service.

POWER PUMPS — 5 to 750 GPM. Pressures 300 psi.

BLACKMER Rotary PUMPS
"BUCKET DESIGN"—SELF-ADJUSTING FOR WEAR

Oil MARKETS



Mid-Continent

TULSA, July 31—Improvement in supply situation was reported in Mid-Continent. Several refiners said they were unable to get as much material through pipeline exchanges this month as in June due to lack of supplies at terminals. Increasing demand for gasoline in Kansas was indicated by a refiner who said he had sold unaccountably large volume—in excess of daily production—this week.

Two cars Grade 26-70 natural gasoline were reported sold at 3.875c, f.o.b. Group 3; no sales were reported f.o.b. Breckenridge, and quotations of two sellers remained at 3.5c.

California

LOS ANGELES, July 31 — The Pacific Coast market remained generally unchanged. Refiners reported gasoline in heavy demand with the extreme bottom of the price scale at 5c, 6c, and 7c for the 3 grades.

Some refiners were hampered in their operations by inability to obtain casinghead. Spot market for the product has just about disappeared.

Mid-Western

CHICAGO, July 31 — Continuing strong demand for all grades of gasoline with very little material available on the open market was report of refiners and marketers in Mid-West last week. Entire Mid-West has noticed a great increase in Ethyl sales and Michigan refiners remarked that present demand for Ethyl is strongest they have ever experienced. Fuel oil demand has still not shown increase refiners and marketers expected. No price changes reported.

Gulf

NEW YORK, July 31 — Gasoline supplies at the Gulf Coast were reported critically low the past week. Transportation is good, but no supplies are available, refiners said. With the government taking about 95% of allocations, one refiner said there was nothing left for the local trade. Quotations at all points unchanged.

Atlantic Coast

NEW YORK, July 31 — With the month ended, suppliers reported little change in the market for refined products at East Coast points. No. 2 fuel oil continued scarce, and gasoline reported very low. Kerosine was said to be "flooding the market." Heavy fuels were also reported more plentiful. No price changes reported on any product.

CRUDE PRICES

Since changes in crude oil prices are so few, the 2 pages of crude oil price tables hereafter will be printed only when there are sufficient changes in prices to warrant.

In the meantime a record is being kept in the Cleveland office of NPN and OILGRAM from which the publishers will be glad to make proofs, or letters or affidavits as to what the prices are, and without charge to regular subscribers. Changes in crude oil prices will be specially noted in this market section when made.

Crude Price Changes

(No changes reported during week ended July 31. For latest tables of crude prices see NPN July 21, pages 33, 34; also notices of changes July 28, page 39).

Index of Governmental Orders Concerning Petroleum Prices

Orders, "requests", "ceilings", and other statements issued by governmental agencies concerning prices of petroleum and products, prices for which are published in this market section of NATIONAL PETROLEUM NEWS, have been published as follows:

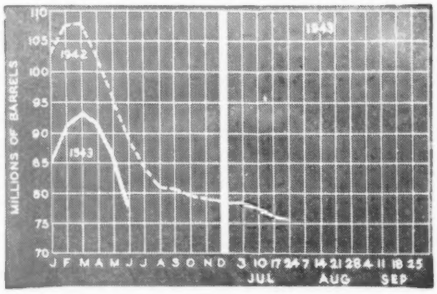
(For orders issued prior to March, see NPN of March 17, p. 47; Jan. 13, p. 41; Jan. 6, p. 41; and Nov. 25, p. 39.)

	NATIONAL PETROLEUM NEWS	PLATT'S OILGRAM	Platt's OIL-Law-GRAM
Mar. 3, '43—New ceilings for residuals and blends set up	Mar. 10, p. 10	Mar. 3, p. 2	P. 300.144
Mar. 16, '43—Fuel oil price increase of .3c extended to Washington and Oregon	Mar. 24, p. 9	Mar. 17, p. 2	P. 300.152 P. 272.54
Mar. 17, '43—Kerosine ceiling raised at Gulf Coast refineries and in District 1	Mar. 24, p. 10	Mar. 18, p. 1	P. 300.153 P. 272.55
Mar. 24, '43—Price basis for crude at well revised	Mar. 31, p. 12	Mar. 24, p. 1	P. 300.157
Mar. 26, '43—California crudes and residual ceiling increased 25c per bbl.	Mar. 31, p. 12	Mar. 26, p. 1	P. 300.159
Mar. 30 '43—Kerosine tank wagon ceiling raised .2c in Hartford, Conn. area	Apr. 7, p. 12	Mar. 30, p. 2	P. 300.167
Apr. 1, '43—California price increase extended to all levels in District 5	Apr. 7, p. 11	Apr. 1, p. 2	P. 300.164
Apr. 2, '43—.3c fuel oil increase extended to 20 Idaho counties	Apr. 7, p. 11	Apr. 3, p. 2	P. 300.169 P. 272.59
Apr. 6, '43—Only aviation gasoline with 87-octane rating or over exempt from price control	Apr. 14, p. 8	Apr. 6, p. 1	P. 272.58
Apr. 10, '43—Discount provisions revised	Apr. 14, p. 8	Apr. 12, p. 1	P. 300.170
Apr. 10, '43—Ceiling set on South Bangor Pool, Van Buren County, Mich. crude	Apr. 14, p. 8	Apr. 12, p. 1	P. 300.171
Apr. 12, '43—All California crude prices increased	Apr. 14, p. 8	Apr. 12, p. 1	P. 300.172
Apr. 22, '43—Ceiling set for Wyoming Elk Basin (Tensleep crude) of 90c per bbl.	Apr. 28, p. 14	Apr. 22, p. 1	P. 300.174
May 17, '43—Ceiling raised for North, North Central Texas and Tillman County, Okla. crude; new maximum set for Tinsley Field, Miss. crude	May 26, p. 14	May 17, p. 2	P. 300.178
May 17, '43—Ville Platte, La. crude ceiling increased	May 26, p. 14	May 17, p. 2	P. 300.180
May 18, '43—Refinery and seaboard ceiling set for No. 2 fuel oil in Boston area	May 26, p. 14	May 21, p. 2	P. 300.185
May 19, '43—Ceiling set for blenders of No. 5 fuel oil in Chicago	May 26, p. 14	May 19, p. 1	P. 300.184
May 27, '43—Specific ceilings set on No. 2 fuel oil in Schenectady, N. Y. area	June 2, p. 11		P. 300.188
May 28, '43—Ceilings set on crudes from Talco and Sulphur Bluff Fields, Tex.	June 9, p. 14	May 31, p. 2	P. 300.192
May 31, '43—Tank wagon ceilings set for kerosine in Greenwich, Waterbury and Norfolk, Conn. areas and in Conway, N. H. area	June 9, p. 14	June 2, p. 2	P. 300.190 P. 272.63
June 3, '43—Texas and Louisiana Gulf Coast prices revised	June 9, p. 14	June 3, p. 2	P. 300.193
June 14, '43—Ceilings increased for retailers who are not tank wagon buyers	June 23, p. 11	June 15, p. 2	P. 272.64
June 14, '43—Specific ceilings set on tank wagon prices for No. 2 fuel oil in New Haven	June 23, p. 11	June 15, p. 2	P. 300.196
June 15, '43—Texas Panhandle crude ceiling increased	June 23, p. 11	June 16, p. 2	P. 300.197
June 24, '43—Tank wagon and steel barrel prices set on fuel oil in Philadelphia	June 30, p. 11	June 25, p. 2	P. 300.200
July 6, '43—Ceilings set for original suppliers of No. 2 fuel oil in Boston	July 14, p. 10	July 6, p. 2	300.204
July 7, '43—Premium contract prices for crude permitted	July 14, p. 10	July 7, p. 2	300.206
July 10, '43—Specific ceilings set for Ethyl gasoline in Pittsburgh	July 21, p. 12	July 12, p. 2	300.208
July 14, '43—Wyoming residual ceilings cut	July 21, p. 12	July 14, p. 2	300.209
July 15, '43—Tank wagon differentials for gasoline on Northeast Coast set up	July 21, p. 12	July 15, p. 2 July 20, p. 2	300.211

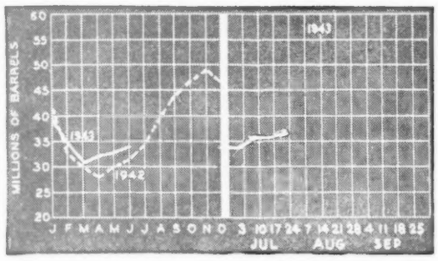
STATISTICS

Monthly figures are actual as reported by Bureau of Mines. Weekly figures are as estimated by American Petroleum Institute on Bureau of Mines basis, except crude stocks which are as reported by Bureau of Mines.

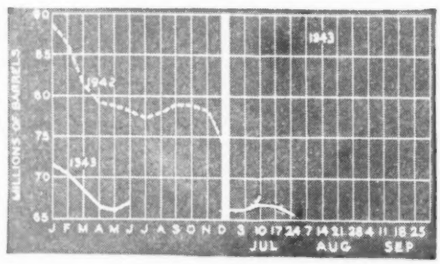
Gasoline Stocks (Finished and Unfinished)



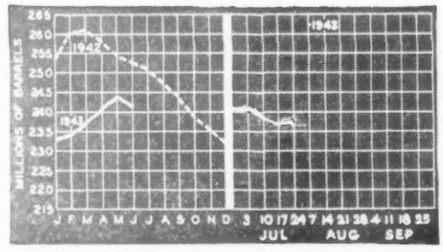
Gas Oil and Distillate Stocks



Residual Fuel Oil Stocks



Crude Stocks



Refinery Operations

(American Petroleum Institute figures in thousands of barrels of 42 gallons each. Figures include reported totals plus an estimate of unreported amounts and are therefore on a Bureau of Mines basis.)

Districts	Daily Potential Refining Capacity Week Ended July 24	Daily Potential Refining Capacity Week Ended July 17	Per Cent of Refining Capacity Reporting Week Ended July 24	Per Cent of Refining Capacity Reporting Week Ended July 17	Daily Average Crude Runs to Stills Week Ended July 24	Daily Average Crude Runs to Stills Week Ended July 17	Per Cent of Reporting Capacity Operated Week Ended July 24	Per Cent of Reporting Capacity Operated Week Ended July 17
Combined°°	2,444	2,444	88.7	88.7	1,888	1,889	77.3	77.3
Appalachian	177	177	84.8	84.8	143	146	80.8	82.5
Ind., Ill., Ky.	824	824	85.2	85.2	753	723	91.4	87.7
Okla., Kans., Mo.	416	416	80.1	80.1	348	354	83.7	85.1
Rocky Mt.	147	147	55.9	55.9	96	96	65.3	65.3
California	817	817	89.9	89.9	745	754	91.2	92.3
Total U. S.—B. of M. Basis	4,825	4,825	86.4	86.4	3,973	3,962	82.3	82.1
U. S.—B. of M. Basis, July 25, 1942					3,640			

Districts	Gasoline Production at Refineries inc. Natural Blended Week Ended July 24	Gasoline Production at Refineries inc. Natural Blended Week Ended July 17	Stocks of Finished and Unfinished Gasoline Week Ended July 24	Stocks of Finished and Unfinished Gasoline Week Ended July 17	Total Stocks Gas Oil & Distillates Week Ended July 24	Total Stocks Gas Oil & Distillates Week Ended July 17	Total Stocks Residual Fuel Oil Week Ended July 24	Total Stocks Residual Fuel Oil Week Ended July 17
Combined°°	5,267	5,155	30,904	31,326	15,122	14,556	14,162	13,600
Appalachian	416	427	2,159	2,134	1,056	1,047	509	551
Ind., Ill., Ky.	2,627	2,393	15,051	15,248	5,623	5,304	3,270	3,329
Okla., Kans., Mo.	1,161	1,141	6,267	6,192	2,026	2,012	1,693	1,659
Rocky Mt.	278	266	1,733	1,764	355	360	659	654
California	1,674	1,807	19,600	19,901	11,707	11,757	46,699	47,224
Total U. S.—B. of M. Basis	11,423	11,189	75,714°	76,565	35,889	35,036	66,992	67,017
U. S.—B. of M. Basis July 25, 1942	10,706		80,762		36,046		77,512	

°Finished 65,264,000 bbl.; Unfinished 10,450,000 bbl.

°°Includes East Coast, Inland Texas, Texas Gulf, Louisiana Gulf, and North Louisiana-Arkansas districts. District 1 inventory index is 35.2% of normal.

Crude Oil Stocks

(Bureau of Mines Figures in thousands of barrels)

Grade or Origin	July 17	July 24	Change from July 17
Pennsylvania Grade	2,602	2,664	+ 62
Other Appalachian	1,496	1,526	+ 30
Lima-Michigan	966	1,040	+ 74
Illinois-Indiana	12,332	12,251	— 81
Arkansas	2,738	2,726	— 12
Kansas	8,329	8,315	— 14
Louisiana:	15,165	15,164	— 1
Northern	5,356	5,418	+ 62
Gulf Coast	9,809	9,746	— 63
Mississippi	1,321	1,282	— 29
New Mexico	6,862	7,091	+229
Oklahoma	37,266	36,526	—740
Texas:	101,671	101,867	+196
East Texas	20,854	21,024	+170
West Texas	25,023	25,123	+100
Gulf Texas	29,530	29,652	+122
Other Texas	26,264	26,068	—196
Panhandle	5,687	5,697	+ 10
North	6,554	6,622	+ 68
South	5,413	5,270	—143
Other	8,610	8,479	—131
Rocky Mountain	13,470	13,482	+ 12
California	33,153	33,233	+ 80
Foreign	69	112	+ 43
Total gasoline-bearing in U. S.	237,440	237,279	—161
Heavy in California	10,242	10,010	—232

N.P.N. Gasoline Index

	Dealer T.W. Cents Per Gal.	Tank Car Cents Per Gal.
Aug. 2	10.37	6.92
Month ago	10.57	6.75
Year ago	11.30	7.10

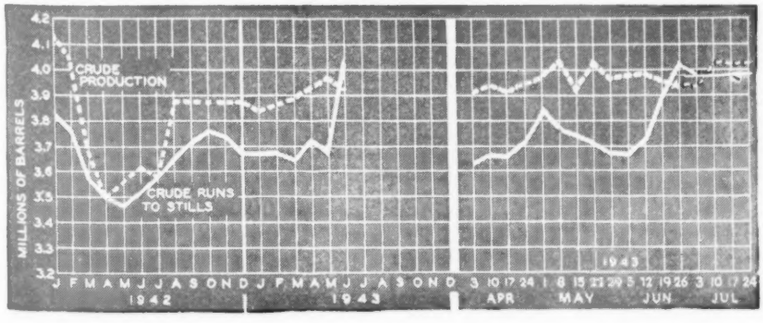
Dealer index is an average of "undivided" dealer prices, ex-tax, in 50 cities.

Tank car index is weighted average of following wholesale markets for regular-grade gasoline, FOB refineries or terminals: Okla., Mid-Western, W. Penna., Calif., N. Y. Harbor, Philadelphia, Jacksonville, Boston and Gulf Coast.

Pennsylvania Crude Runs

(Compiled by National Petroleum Assn. from reports of all companies which refined Pennsylvania crude. Figures in barrels.)

Week Ended	Daily Average	Week Ended	Daily Average
Jan. 2	75,279	Apr. 24	76,625
Jan. 9	70,842	May 1	76,555
Jan. 16	78,155	May 8	77,088
Jan. 23	77,551	May 15	79,366
Jan. 30	74,034	May 22	76,684
Feb. 6	67,494	May 29	76,488
Feb. 13	69,103	June 5	71,505
Feb. 20	78,797	June 12	76,766
Feb. 27	77,285	June 19	68,115
Mar. 6	70,389	June 26	69,551
Mar. 13	73,184	July 3	68,542
Mar. 20	77,828	July 10	75,188
Mar. 27	82,224	July 17	73,156
Apr. 3	81,095	July 24	62,047
Apr. 10	74,317	1942 Low	67,243
Apr. 17	70,445	1942 High	87,251


MILLIONS OF BARRELS
CRUDE PRODUCTION
CRUDE RUNS TO STILLS
1942
1943
J F M A M J J A S O N D J F M A M J J A S O N D 3 10 17 24 1 8 15 22 29 5 12 19 26 3 10 17 24
APR MAY JUN JUL

U. S. Crude Oil Production

(American Petroleum Institute figures)

	WEEK ENDED July 24 Barrels (Daily Average)	WEEK ENDED July 17 Barrels (Daily Average)		WEEK ENDED July 24 Barrels (Daily Average)	WEEK ENDED July 17 Barrels (Daily Average)
Oklahoma	329,950	330,650	East'n (Ill., Ind. & Ky. excl'd)	76,400	77,850
Kansas	306,150	293,700	Kentucky	23,150	21,350
Nebraska	2,200	2,150	Michigan	55,800	55,900
Texas	1,615,600	1,615,600	Wyoming	96,500	93,700
Louisiana	349,050	349,250	Montana	20,850	20,900
Arkansas	77,300	77,200	Colorado	7,300	7,400
Mississippi	54,150	50,850	New Mexico	104,050	103,950
Illinois	215,400	210,000	California	770,800	780,300
Indiana	14,050	12,350	Total U. S.	4,118,700	4,103,100

REFINERY and SEABOARD PRICES

In bulk lots by Motor Transport, Tank Car, Barge or Tanker as shown

NOTE—Parenthetical figures after prices indicate number of companies quoting when less than three companies are quoting.

HOW PRICES ARE REPORTED—

Refinery and Seaboard prices in National Petroleum News are gathered by PLATT'S OILGRAM and are published in the Monday issue of the OILGRAM.

PLATT'S OILGRAM is a reporting service issued in three identical editions daily from News Bureaus at New York, Cleveland, and Tulsa, Okla. PLATT'S OILGRAM gathers and publishes what its publisher and representatives believe to be accurate news of sales, prices and current happenings affecting the oil industry and that will be of interest to its subscribers. As this information is usually private, OILGRAM reports it according to what it is able to obtain from sources deemed reliable.

All information is supplied without guarantee as to its completeness, accuracy, time of transmission or promptness of delivery.

The subscriber receives this information for his private use and not for resale or further distribution.

Publisher reserves the right to change the extent, nature and form of showing this information at any time.

Prices shown in the tables are quotations (meaning sellers' general offers or posted prices), or actual sales prices, reported to OILGRAM by refiners for "open spot" transactions, except as otherwise specified.

Prices arrived at by discounts off a specified price or "market date of shipment," prices named in contracts or prices arrived at in accordance with any arrangement made prior to date of sale, are not for "open spot" transactions and therefore are not considered in making the price tables. Prices made to brokers and prices in "Inter-refinery" transactions are also not considered except as may be noted.

All prices are for "immediate" shipment except in Gulf Coast bulk transactions where shipment is generally to be made in ninety days. Prices are FOB refineries, pipelines, or tanker terminals in districts designated.

Prices shown are for quantities in bulk such as tank car lots, motor transport lots or barge lots; and in cents per gallon; heavy fuel oils are in dollars per barrel of 42 U.S. gallons; wax and petrolatums are in cents per pound. Prices applying to barges or cargoes only are so designated.

Prices do not include taxes or inspection fees. Prices are published at the close of the business day.

Mid-Western prices in the tables were gathered from refiners with offices located in Chicago and the surrounding territory. While the prices are quoted on a Group 3 (Oklahoma) freight basis, this is in accordance with the custom of the oil industry which uses Group 3 as a price basis for the ease of comparing prices even when the material originates in another refining district. Other refinery prices are given by and for the particular refining district where the material is made and from which it is shipped.

When prices obtained by OILGRAM do not conform to these conditions the exception and the new conditions are noted in the news lead or in conjunction with the price table by footnote or otherwise, for the particular refinery or sales district involved.

Crude oil and products covered by OILGRAM'S news and price service, except where noted, have been represented to the publisher as fully up to the customary trade specifications indicated and according to the generally accepted methods of test; and all crude oil and all products thereof as having been lawfully produced and transported.

Any apparent error should be reported to the nearest OILGRAM or National Petroleum News office at once as no correction will be made after the second issue of the OILGRAM or National Petroleum News following its publication.

NOTICE—Owing to great demand, refiners generally limit quotations to regular customers and refuse bids, though higher, from others. Refiners' prices and sales shown; bids reported in market leads

Summary of Daily Gasoline Prices (July 26 to Aug. 2)

	Monday Aug. 2	Friday July 30	Thursday July 29	Wednesday July 28	Tuesday July 27
U. S. Motor (ASTM octane)					
78 octane Ethyl:					
Oklahoma	6.75 – 6.875	6.75 – 6.875	6.75 – 6.875	6.75 – 6.875	6.75 – 6.875
Mid-Western (Group 3 basis)	6.75 – 7.125	6.75 – 7.125	6.75 – 7.125	6.75 – 7.125	6.75 – 7.125
N. Tex. (For shpt. to Tex. & N. M. dest'ns.)	6.875– 7	6.875– 7	6.875– 7	6.875– 7	6.875– 7
W. Tex. (For shpt. to Tex. & N. M. dest'ns.)	7 (2)	7 (2)	7 (2)	7 (2)	7 (2)
72-74 octane:					
Oklahoma	5.875– 6	5.875– 6	5.875– 6	5.875– 6	5.875– 6
Mid-Western (Group 3 basis)	5.875– 6	5.875– 6	5.875– 6	5.875– 6	5.875– 6
N. Tex. (For shpt. to Tex. & N. M. dest'ns.)	5.875– 6	5.875– 6	5.875– 6	5.875– 6	5.875– 6
W. Tex. (For shpt. to Tex. & N. M. dest'ns.)	6	6	6	6	6
63-66 octane:					
Oklahoma	5.5 – 5.625	5.5 – 5.625	5.5 – 5.625	5.5 – 5.625	5.5 – 5.625
Mid-Western (Group 3 basis)	5.5 – 5.625	5.5 – 5.625	5.5 – 5.625	5.5 – 5.625	5.5 – 5.625
N. Tex. (For shpt. to Tex. & N. M. dest'ns.)	5.5 (2)	5.5 (2)	5.5 (2)	5.5 (2)	5.5 (2)
W. Tex. (For shpt. to Tex. & N. M. dest'ns.)	5.75(1)	5.75(1)	5.75(1)	5.75(1)	5.75(1)
60 octane & above:					
Oklahoma	5.125– 5.25	5.125– 5.25	5.125– 5.25	5.125– 5.25	5.125– 5.25
Mid-Western (Group 3 basis)	5.1 – 5.25	5.1 – 5.25	5.1 – 5.25	5.1 – 5.25	5.1 – 5.25
N. Tex. (For shpt. to Tex. & N. M. dest'ns.)	5.125– 5.25	5.125– 5.25	5.125– 5.25	5.125– 5.25	5.125– 5.25
W. Tex. (For shpt. to Tex. & N. M. dest'ns.)	5.25	5.25	5.25	5.25	5.25
Motor Gasoline, 72-74 octane (ASTM)					
New York harbor	9.2 – 9.4	9.2 –10.2	9.2 –10.2	9.2 –10.2	9.2 –10.2
New York harbor, barges	9.1 – 9.3	9.1 – 9.3	9.1 – 9.3	9.1 – 9.3	9.1 – 9.3
Philadelphia district	9.2	9.2 – 9.7	9.2 – 9.7	9.2 – 9.7	9.2 – 9.7
Baltimore district	8.95	8.95	8.95	8.95	8.95
Motor Gasoline:					
Western Penna. Bradford-Warren:					
"Q" Gasoline, Min. 70 Oct. (ASTM)	7.5–8.95	7.5–7.75(2)	7.5 – 8.95	7.5 – 8.95	7.5 – 8.95
Western Penna. Other Districts:					
"Q" Gasoline, Min. 70 Oct. (ASTM)	7.5 – 7.75	7.5 – 7.75	7.5 – 7.75	7.5 – 7.75	7.5 – 7.75

REFINERY PRICES

Gasoline—U. S. Motor (ASTM) except where otherwise specified

Prices in Effect	Aug. 2	July 26
OKLAHOMA		
78 oct. Ethyl	6.75 – 6.875	6.75 – 6.875
72-74 oct.	5.875– 6	5.875– 6
63-66 oct.	5.5 – 5.625	5.5 – 5.625
60 oct. & below	5.125– 5.25	5.125– 5.25
60-62, 400 e.p.	5.125 (1)	5.125 (1)
MID WESTERN (Group 3 basis)		
78 oct. Ethyl	6.75 – 7.125	6.75 – 7.125
72-74 oct.	5.875– 6	5.875– 6
63-66 oct.	5.5 – 5.625	5.5 – 5.625
60 oct. & below	5.1 – 5.25	5.1 – 5.25
N. TEX. (For shpt. to Tex. & N. M. dest'ns.)		
78 oct. Ethyl	6.875– 7	6.875– 7
72-74 oct.	5.875– 6	5.875– 6
63-66 oct.	5.5 (2)	5.5(2)
60 oct. & below	5.125– 5.25	5.125– 5.25
60-62, 400 e.p.	5.375(1)	5.375 (1)
W. TEX. (For shpt. to Tex. & N. M. dest'ns.)		
78 oct. Ethyl	7 (2)	7 (2)
72-74 oct.	6	6
63-66 oct.	5.75 (1)	5.75 (1)
60 oct. & below	5.25	5.25
CENT. W. TEX. (Prices to truck transports)		
80 oct. & above	7 (2)	7 (2)
72-74 oct.	6 (2)	6 (2)
67-69 oct.	.....	.....
62 oct. & below	5.25(2)	5.25(2)
AMARILLO, TEX. (For shpt. to W. Okla. & Tex. differential territory.)		
60 oct. & below	No Price	No Price
60-62, 400 e.p.	No Price	No Price
KANSAS (For Kansas destinations only)		
78 oct. Ethyl	7.25 (1)	7.25 (1)
72-74 oct.	6 –6.2 (2)	6 –6.2 (2)
63-66 oct.	5.625–5.8 (2)	5.625–5.8 (2)
60 oct. & below	5.25 –5.4 (2)	5.25 –5.4 (2)

Prices in Effect	Aug. 2	July 26
ARK. (For shipment to Ark. & La.)		
72-74 oct., leaded	6 (1)	6 (1)
70-72 oct. "	5.875 (1)	5.875 (1)
62 oct. "	5.5 (1)	5.5 (1)
60 oct. & below, unleaded	5.375 (1)	5.375 (1)
WESTERN PENNA. (Motor gasoline)		
Bradford-Warren:		
"Q" Gasoline, Min. 70 Oct. (ASTM)	7.5 – 8.95	7.5 – 8.95
Other districts:		
"Q" Gasoline Min. 70 Oct. (ASTM)	7.5 – 7.75	7.5 – 7.75
CENTRAL MICHIGAN (FOB Central Mich. refinery group basis for shpt. within Mich.; shpts. may originate at plants outside Central group.)		
U.S. Motor: (Oct. ASTM):		
72-74 oct.	8 – 8.5	8 – 8.5
67-69 oct.	7.5 (1)	7.5 (1)
Str. run gasoline, excluding Detroit shpt.	6	6
OHIO (S. O. Ohio quotations for statewide delivery and subject to exceptions for local price disturbances)		
72-74 oct.	8.375	8.375
CALIFORNIA U.S. Motor:		
78 oct. & above (Ethyl)	7 – 8.75	7 – 8.75
70-75 oct. (regular)	6 – 7.75	6 – 7.75
65 oct. & below (3rd grade)	5 – 6.75	5 – 6.75

Kerosine, & Gas Fuel Oils

Prices in Effect	Aug. 2	July 26
OKLAHOMA		
41-43 grav. w.w.	4.375– 4.5	4.375– 4.5
42-44 grav. w.w.	4.5	4.5
Range Oil	4 – 4.125	4 – 4.125
No. 1 P.W.	3.875	3.875
No. 1 straw	3.875–4 (1)	3.875–4 (1)
No. 2 straw	3.625 (2)	3.625(2)
No. 3 fuel	3.5 (2)	3.5 (2)
U. G. I. Gas Oil	3.625–3.75 (1)	3.625–3.75(1)
No. 6 fuel	.....	.....
14-16 fuel	$0.97	$0.97
MID-WESTERN (Group 3 basis)		
41-43 grav. w.w.	4.375	4.375
42-44 grav. w.w.	4.5	4.5
Range Oil	4 – 4.1 (2)	4 – 4.1 (2)
No. 1 p.w.	3.875	3.875
No. 2 straw	3.625	3.625
No. 3	3.5 (2)	3.5 (2)
No. 5	$0.85 (1)	$0.85 (1)
No. 6	$0.80 (1)	$0.80 (1)
N. TEX. (For shpt. to Tex. & N. M. dest'ns.)		
41-43 grav. w.w.	4.25 – 4.75	4.25– 4.75
No. 1 P.W.	4.2 (1)	4.2(1)
AMARILLO, TEX. (For shpt. to W. Okla. & Tex. differential territory.)		
41-43 grav. w.w.	No Price	No Price
No. 1 straw	No Price	No Price
KANSAS (For Kansas destinations only).		
41-43 grav. w.w.	No Price	No Price
42-44 grav. w.w.	4.7–4.875 (2)	4.7–4.875 (2)
No. 1 p.w.	4.1–4.25 (2)	4.1–4.25 (2)
No. 6 fuel	$0.85 (1)	$0.85 (1)

REFINERY PRICES (Continued)

NOTE—Parenthetical figures after prices indicate number of companies quoting when less than three companies are quoting.

NOTICE—Owing to great demand, refiners generally limit quotations to regular customers and refuse bids, though higher, from others. Refiners' prices and sales shown: bids reported in market leads.

Kerosine, & Gas Fuel Oil

(Continued)

Prices in Effect	Aug. 2	July 26
ARK. (For shipment to Ark. and La.)		
41-43 grav. w.w.	4.625 (1)	4.625 (1)
No. 1	4 (1)	4 (1)
No. 2	3.5 (1)	3.5 (1)
No. 3 fuel	3.5 (1)	3.5 (1)
Tractor fuel, tar shpt to Ark. points only	5.125 (1)	5.125 (1)
WESTERN PENNA.		
Bradford-Warren:		
45 grav. w.w.	6.55 – 8.05	6.55– 8.05
46 grav. w.w.	6.675 (1)	6.675 (1)
No. 1 fuel	6.55 – 8.05	6.55 – 8.05
No. 2 "	6.625–7.625 (2)	6.625-7.625(2)
No. 3 "	6.625–7.75 (2)	6.625-7.75 (2)
36-40 gravity	6.625–6.75 (2)	6.625-6.75(2)
Other districts:		
45 grav. w.w.	6.75 – 7.925	6.75 – 7.925
46 grav. w.w.	6.875– 7	6.875– 7
47 grav. w.w.	7 – 7.5	7 – 7.5
No. 1 fuel	6.625	6.625
No. 2 "	6.5 – 7.125	6.5 – 7.125
No. 3 "	6.5 – 7.125	6.5 – 7.125
36-40 grav., Pittsburgh dist. prices excluded	6.5 – 7	6.5 – 7
CENTRAL MICHIGAN (FOB Central Mich. refinery group basis for shpt. within Mich.; shpts. may originate at plants outside Central group.)		
47-49 gravity w.w.	5.8 – 6	5.8 – 6
P.W. Distillate	5.5	5.5
No. 3 gas oil, Straw	5	5
U.G.I. gas oil	4.5 (2)	4.5 (2)
Fuel Oils (Vis. at 100).		
300-500 Vis.	....	....
100-300 Vis.	4.5	4.5
OHIO (S. O. quotations for statewide delivery)		
Kerosine	7	7
CALIFORNIA		
40-43 grav. w.w.	5 – 7	5 – 7
San Joaquin Valley:		
Heavy fuel	$1.10 (2)	$1.10 (2)
Light fuel	$1.20(2)	$1.20(2)
Diesel fuel	4 (2)	4 (2)
Stove dist.	5 (2)	5 (2)
Los Angeles:		
Heavy fuel	$1.10 (2)	$1.10 (2)
Light fuel	$1.20(2)	$1.20(2)
Diesel fuel	3.5– 4(2)	3.5– 4(2)
Stove dist.	3 – 5	3 – 5
San Francisco:		
Heavy fuel	$1.15 (1)	$1.15 (1)
Light fuel	$1.25 (1)	$1.25 (1)
Diesel fuel	4.5 (1)	4.5 (1)
Stove dist.	5.5 (1)	5.5 (1)

Note: All above heavy fuels meet Pacific specification 400; light fuel, spec. 300; Diesel fuels, spec. 200; and stove distillate, spec. 100.

Lubricating Oils

WESTERN PENNA.

Prices are for sales made, or offers reliably reported, to jobbers & compounders only.

Viscous Neutrals—No. 3 col. Vis. at 70°F.

200 Vis. (180 at 100°) 420-425 fl.		
0 p.t.	31.5 (1)	31.5 (1)
10 p.t.	30.5 (1)	30.5 (1)
15 p.t.	29.5 (1)	29.5 (1)
25 p.t.	25–28	25-28
150 Vis. (143 at 100°) 400-405 fl.		
0 p.t.	29.5 (1)	29.5 (1)
10 p.t.	28.5 (1)	28.5 (1)
15 p.t.	27.5 (1)	27.5 (1)
25 p.t.	23–26	23-26
Cylinder Stocks		
Brt. stk., 145-155 vis. at 210°, 540-550 fl., No. 8 col.		
10 p.t.	30.5 (1)	30.5 (1)
15 p.t.	29.5 (1)	29.5 (1)
25 p.t.	25	25
600 S.R. filterable	15	15
650 S.R.	15.5	15.5
600 fl.	16	16
630 fl.	17	17

MID-CONTINENT (F. o. b. Tulsa)

Neutral Oils (Vis. at 100° F. 0 to 10 P.P.)

Pale Oils:

Vis. Color		
60-85—No. 2	8	8
86-110—No. 2	8.5 (2)	8.5 (2)
150—No. 3	14.5	14.5
180—No. 3	15	15
200—No. 3	15	15
250—No. 3	16-16.5	16-16.5
280—No. 3	17	17
300—No. 3	18 (2)	18 (2)

Lubricating Oils (Cont'd)

Prices in Effect	Aug. 2	July 26
Red Oils:		
180—No. 5	15 (1)	15 (1)
200—No. 5	15 (1)	15 (1)
280—No. 5	No Price	No Price
300—No. 5	17.5 (2)	17.5 (2)

Note: Viscous Neutrals, 15-25 p.p. generally are quoted 0.5c under 0-10 p.p. oils. Non-viscous oils, 15-25 p.p.; generally are quoted 0.25c under 0-10 p.p. oils.

Bright Stock—Vis. at 210°		
200 Vis. D	27 (1)	27 (1)
150-160 Vis. D:		
0 to 10 p.p.	23	23
10 to 25 p.p.	22.5–23	22.5–23
25 to 40 p.p.	23 (1)	23 (1)
150-160 Vis. E	22 (1)	22 (1)
120 Vis. D:		
0 to 10 p.p.	22 (2)	22 (2)
600 S.R. Dark Green	8.5 (1)	8.5 (1)
600 S.R. Olive Green	10–11	10–11
631 S.R.	18.5 (1)	18.5 (1)
Black Oil	5.5 (1)	5.5 (1)

QUALIFYING PRICE NOTE: Prices on neutrals are posted prices from which refiners allow special discounts, ranging to 3c to meet varying local competition.

SOUTH TEXAS Neutral Oils

Vis. Color		
Pale Oils: (*Vis. at 100°F.*)		
100 No. 1½-2½	6.5	6.5
200 No. 2-3	8.75	8.75
300 No. 2-3	9.25	9.25
500 No. 2½-3½	10	10
750 No. 3-4	10.25	10.25
1200 No. 3-4	10.375	10.375
2000 No. 4	10.5	10.5
Red Oils:		
100 No. 5-6	6.5 (2)	6.5 (2)
200 No. 5-6	8.75	8.75
300 No. 5-6	9.25	9.25
500 No. 5-6	10	10
750 No. 5-6	10.25	10.25
1200 No. 5-6	10.375	10.375
2000 No. 5-6	10.5–11.5	10.5–11.5

CHICAGO (From Mid-Continent p.l. crude.)

Neutral oils (Vis. at 100° F. 0 to 10 p.p.)

Pale Oils Vis. Color		
60-85—No. 2	9.5 (1)	9.5 (1)
86-110—No. 2	10.1	10.1
150—No. 3	15.5 (1)	15.5 (1)
180—No. 3	16 (1)	16 (1)
200—No. 3	16 (1)	16 (1)
250—No. 3	17 (1)	17 (1)
Red Oils:		
180—No. 5	16 (1)	16 (1)
200—No. 5	16 (1)	16 (1)
250—No. 5	17 (1)	17 (1)
280—No. 5	18 (1)	18 (1)
300—No. 5	18.5 (1)	18.5 (1)

Note: Viscous oils, 15 to 30 p.p. are quoted 0.5c lower: 60-85 and 86-110 No. 2 non-viscous oils, 15 to 30 p.p., 0.25c lower.

Unfiltered Steam Refined: (Viscosity at 210°)		
140	11.5 (1)	11.5 (1)
160	12.5 (1)	12.5 (1)
200	13.5 (1)	13.5 (1)
Bright stocks, 160 vis. at 210 No. 8 color:		
0 to 10 p.p.	24 (1)	24 (1)
15 to 25 p.p.	23.5 (1)	23.5 (1)
30 to 40 p.p.	21.5 (1)	21.5 (1)
E filtered Cyl. Stock	15.5 (1)	15.5 (1)

Note: To obtain prices delivered in Chicago, add 0.25c per gal.

Natural Gasoline

(Group 3 & Breckenridge prices are to blenders on freight basis shown below. Shipments may originate in any Mid-Continent manufacturing district.)

FOB GROUP 3		
Grade 26-70	3.875 (Qtns.)	3.875 (Qtns.)
FOB BRECKENRIDGE		
Grade 26-70	3.5 (Qtns.)	3.5 (Qtns.)
CALIFORNIA (FOB plants in Los Angeles basin)		
21 pound vapor pressure for blending	4.75 – 5.375	4.75 – 5.375

Naphtha and Solvent

Prices in Effect	Aug. 2	July 26
(FOB Group 3		
Stoddard solvent	6.625	6.625
Cleaners' naphtha	7.125	7.125
V. M. & P. naphtha	7.125	7.125
Mineral spirits	6.125	6.125
Rubber solvent	7.125	7.125
Lacquer diluent	7.375– 8.125	7.375– 8.125
Benzol Diluent	8.375– 8.625	8.375– 8.625
WESTERN PENNA.		
Bradford-Warren District		
Stoddard Solvent	7.5 (1)	7.5 (1)
Other Districts:		
Untreated naphtha	7 – 7.25	7 – 7.25
Stoddard solvent	7 – 7.75	7 – 7.75
OHIO (S. O. quotations for statewide delivery):		
V.M.&P. naphtha, D.C. naphtha, Varnolene & Sohio solvent	10	10
Rubber solvent	9	9

Wax

White Crude Scale:

WESTERN PENNA. (Bbls. C.L.)		
122-124 A.m.p.	4.25 (2)	4.25 (2)
124-126 A.m.p.	4.25	4.25
OKLAHOMA (C.L. FOB Refinery)		
Semi-refined:		
128 AMP min., white, 50 kilo bags	No Price	No Price
132-134 AMP, bbls.	5.25 (1)	5.25 (1)

CHICAGO (FOB Chicago district refinery of one refiner, in bags, carloads. Carloads, slabs loose 0.4c less. Melting points are EMP (ASTM) methods; add 3° to convert into AMP.)

Fully refined:		
122-124 (bags only)	5.6	5.6
125-127	6	6
127-129	6.25	6.25
130-132	6.55	6.55
132-134	6.8	6.8
135-137	7.55	7.55

Petrolatums

WESTERN PENNA. (Bbls., carloads; tank cars, 0.5c per lb. less.)		
Snow White	6.125– 7.25	6.125– 7.25
Lily White	5.375– 6.125	5.375– 6.125
Cream White	4.375– 5.375	4.375– 5.375
Light Amber	3.375– 3.875	3.375– 3.875
Amber	3.125– 3.625	3.125– 3.625
Red	3 – 3.5	3 – 3.5

Group 3 Freight Rates

To Division Headquarters Points of Standard Oil Co. of Indiana

(Cents Per Gal.)

	Gasoline Kerosine	*Distillate Fuel Oil	Gas Oil and/or Residual Fuel Oil
Chicago, Ill.	2.376	2.368	2.368
Decatur, Ill.	2.112	2.112	2.294
Joliet, Ill.	2.376	2.368	2.368
Peoria, Ill.	2.178	2.178	2.294
Quincy, Ill.	2.046	2.046	2.146
Indianapolis, Ind.	2.508	2.886	2.886
Evansville, Ind.	2.310	2.738	2.738
South Bend, Ind.	2.904	2.970	3.108
Detroit, Mich.	4.026	3.774	3.774
Grand Rapids, Mich.	3.597	3.597	3.700
Saginaw, Mich.	4.026	3.922	3.922
Green Bay, Wis.	2.706	2.706	3.034
Milwaukee, Wis.	2.574	2.553	2.553
La Cross, Wis.	2.442	2.442	2.738
Minneapolis-St. Paul	2.442	2.442	2.738
Duluth, Minn.	2.706	2.706	3.071
Mankato, Minn.	2.442	2.442	2.738
Des Moines, Ia.	1.914	1.914	2.146
Davenport, Ia.	2.178	2.178	2.294
Mason City, Ia.	2.244	2.244	2.479
St. Louis, Mo.	1.914	1.914	1.961
Kansas City, Mo.	1.452	1.452	1.665
St. Joseph, Mo.	1.452	1.452	1.665
Fargo, N. D.	3.366	3.366	3.737
Huron, S. D.	2.838	2.838	3.145
Wichita			
From Ponca City	0.561	0.561	0.629
From Tulsa	0.891	0.891	0.999
From Cushing	0.825	0.825	0.925

*Not suitable for illuminating purposes.

SEABOARD PRICES EXPORT AND COASTWISE

NOTE—Parenthetical figures after prices indicate number of companies quoting when less than three companies are quoting.

NOTICE—Owing to great demand, refiners generally limit quotations to regular customers and refuse bids though higher, from others. Refiners' prices and sales shown; bids reported in market leads.

Atlantic Coast

(Prices are of refiners, FOB their refineries & their tanker terminals, & of tanker terminal operators FOB their terminals)—Prices In Effect Aug. 2

MOTOR GASOLINE

District:	Min. 80 Oct. '39 Research (Max. 2 cc Lead)	72-74 Oct. (ASTM)	68-70 Oct. (ASTM)
N. Y. Harb.	....	9.2 – 9.4	9.2(1)
N. Y. Harb., barges	....	9.1 – 9.3	9.1(1)
Albany	....	9.3 – 9.5	....
Philadelphia	....	9.2	....
Baltimore	....	8.95	8.85(1)
Norfolk	....	8.7	8.5(1)
Wilmington, N. C.	....	8.7 – 8.8	8.5(1)
Charleston	....	8.7 – 8.8	8.1(1)
Savannah	....	8.25 – 8.4	....
Jacksonville	....	8.27 8.275(2)	....
Miami	....	8.27	....
Tampa	....	8.27 – 8.4	8.275(1)
Pensacola	....	7 –7.2(1)	....
Mobile	....	7 – 7.2	....
New Orleans	....	6.125– 6.75	....
Portland	....	9.5 – 9.65	....
Boston	....	9.4 – 9.7	9.7(1)
Providence	....	9.4 – 9.7	....

FUEL OILS

	KEROSINE and/or NO. 1 FUEL	No. 2	No. 3	No. 5	No. 6
N. Y. Harb.	7.1	6.7	6.7	$1.95 $2.01(a)	$1.65 –$2.07
N. Y. Harb., barges	7	6.6	6.6	....	....
Albany	7.3	6.8	6.8(2)	$2.25(1)	$1.85–$2.27(1)
Philadelphia	7.2	6.7	6.7	$1.98	$1.65–$2.07
Baltimore	7.2	6.7	6.7	....	$1.65–$2.07
Norfolk	7.1	6.7	6.7(1)	....	$1.65–$2.07(2)
Wilmington, N. C.	7.05	6.7	....	....	....
Charleston	7.2	6.7(2)	....	....	$1.60–$2.02(2)
Savannah	7.05	....	....	....	$1.60–$2.02(1)
Jacksonville	7.05(2)	6.25	....	....	$1.60–$2.02(1)
Miami	7.05(2)	....	....	....	....
Tampa	7.05	6.25(2)	....	....	$1.50–$1.92(2)
Pensacola	4.8 (1)	....	....	....	....
Mobile	4.75–5.05(2)	....	....	....	....
New Orleans	4.25 – 4.75	3.75(2)	....	$1.27(1)	$0.85–$1.27(2)
Portland	7.3	6.8	6.8(2)	$2.25(1)	$1.65–$2.07(1)
Boston	7.2	6.7	6.7(2)	$1.95–$2.07(2)	$1.65–$2.07
Providence	7.2	6.7	6.7(2)	$1.90–$1.95(2)	$1.65–$2.07

(a) This price is for a straight-run low pour test No. 5 fuel.

	Bunker C Fuel Ships' bunkers (Ex Lighterage)	Diesel Oil Ships' bunkers (Ex Lighterage)	Diesel Oil Shore Plants	Gas House Gas Oil 28-34 Gravity
N. Y. Harbor	$1.65–$2.07	$2.78	6.7 6.8 2)	6.8(2)
Albany	$1.85(1)	$2.98(1)	6.8(1)	7(1)
Philadelphia	$1.65–$2.07	$2.78	....	....
Baltimore	$1.65–$2.07	$2.78	6.7(1)	6.7(1)
Norfolk	$1.65–$2.07	$2.78	6.7(1)	6.7(1)
Charleston	$1.60–$2.02	$2.78 2)	6.7(1)	6.7(1)
Savannah	$1.60–$2.02 (1)	$2.62(1)	....	....
Jacksonville	$1.60–$2.02 (2)	$2.62(2)	....	....
Tampa	$1.50–$1.92	$2.62(2)	....	....
New Orleans	$0.97–$1.09	$1.65(1)	4.1	....
Portland	$1.65–$2.07 (1)	$2.86(2)	6.8 1)	6.9(1)
Boston	$1.65–$2.07	$2.78	6.7(2)	6.8(2)
Providence	$1.65–$2.07	$2.78(2)	6.7(1)	6.8(1)

Residual fuel prices generally vary with A.P.I. specifications from range low for 9.9 & below degrees to range high for 25.0 & above.

Pacific Export

(Quotations at seaboard, Los Angeles, cargo lots except where otherwise noted.)

Prices in Effect	Aug. 2	July 26
375 e.p. blend, 70 oct.	No Price	No Price
390 e.p. blend, 68 oct.	No Price	No Price
390 e.p. blend, 66 oct.	No Price	No Price
400 e.p. blend, 65 oct. min.	No Price	No Price
U. S. Motor, under 65 oct.	No Price	No Price
38-40 grav., w.w. kero., 150 fire point	No Price	No Price
41-43 grav., w.w. kero.	No Price	No Price
44 grav. w.w. kero.	No Price	No Price
Diesel fuel, 24 & above	No Price	No Price
Diesel fuel, under 24	No Price	No Price
30-34 grav. diesel (gas oil) Pac. Spec. 200	No Price	No Price
Grade C fuel, Pac. Spec. 400	No Price	No Price

In Ship's Bunkers, or deep tank lots:

Diesel Fuel, Pac. Spec. 200	$1.40 –$1.45	$1.40 $1.45
Grade C fuel, Pac. Spec. 400	$1.10	$1.10

Cased Goods: (Per case)

375-400 e.p. blend, 65 oct. & above	No Price	No Price
400 e.p. blend under 65 oct.	No Price	No Price
U. S. Motor	No Price	No Price
40-43 grav., w.w. kero., 150 fire point	No Price	No Price
Kero., p.w.	No Price	No Price

MID-CONTINENT LUBES

(At Gulf; in packages, FAS.; in bulk, FOB terminals)

Prices in Effect Aug. 2

	Steel Drums	Bulk
200 Vis. D 210 brt. stock	35 (1)	28.8 (1)
150 vis. D 210 brt. stock 0-10 p.p.	31 (1)	24.8 (1)
10-25 p.p.	....	....
100 vis. D 210 brt. stock 0-10 p.p.	....	....
10-25 p.p.	....	....
200 vis. No. 3 col. neutral: 0-10 p.p.	....	....

Wax

(Melting points are AMP. 3° higher than EMP. Prices are FOB refinery and do not include bag, freight or export differentials).

Prices In Effect Aug. 2

Crude Scale	New Orleans Export	N. Y. Domestic	N. Y. Export
124-6 Yellow	4.25(1)	....	4.25(1)
122-4 White	....	4.25(2)	4.25(2)
124-6 White	4.25(1)	4.25	4.25
Fully Refined:			
123-5	5.2(1)	5.2(2)	5.2(1)
125-7	5.2(1)	5.2(2)	5.2(1)
128-30	5.6(1)	5.6	5.6(1)
130-32	5.85(1)	5.85(2)	5.85(1)
133-5	6.15(1)	6.15	6.15(1)
135-7	6.4(1)	6.4(1)	6.4(1)

Tanker Rates

(Approximate last paid rates, cents per bbl.; Gulf-N. Atlantic, not East of N. Y.)

Hvy. Crude & Fuel (10 to 19.9 gravity)	48
Light Crude, (30 grav. or Lighter)	43
Gasoline	40
Kerosine	40
No. 2 Fuel	42

Note: Increased wartime operating expenses in excess of above rates absorbed by War Shipping Administration.

Gulf Coast

Prices in Effect Aug. 2

	New Orleans & Lower Mississippi to Baton Rouge Tank Cars	Barge	Texas Gulf Coast South of New Orleans Tank Cars	Barges	CARGOES Domestic & Export From all Gulf Ports
MOTOR GASOLINE					
Leaded (oct. by ASTM)					
80 oct. min. Max. 3 cc lead	6.5 – 7.75	6.5 – 7	6.75	6.75	6.25 – 6.75
72-74 oct.	6.125	5.75 – 6.5	5.75	5.75	5.75
63-65 oct.	....	....	....	....	....
Unleaded 70 oct.	....	....	....	....	5.625– 5.75
67-68 oct.	....	....	....	....	5.5 – 5.625
65 oct.	....	....	....	....	5.25
60 oct.	....	....	....	....	5
KEROSINE & LIGHT FUELS					
41-43 w.w. kero.	4.125– 4.25	4.125	4.125– 4.25	4.125	4.125
42-44 w.w. kero.	....	....	4.125	4.125	4.125
No. 2 fuel oil	3.75	3.75	3.75 – 4	3.75	3.75
DIESEL & GAS OILS					
(In diesel index No.)					
Below 43 di.	....	....	....	....	....
43-47 di.	....	....	....	....	4
48-52 di.	4	4	4	4	4
53-57 di.	4.125	4.125	4.125	4.125	4.125
58 and above	....	....	....	....	4.25

Above products in Truck Transports of 2,400 gal. and over ½c above Tank Car Prices.

NOTE—Prices for heavy fuels vary within the range given above according to gravity from 9.9 grav. and below to 25 B and above.

Naphtha

Prices in Effect Aug. 2

	V.M.&P. Naphtha	Mineral Spirits
New York Harbor	11 (2)	10
Philadelphia district	11 (2)	10
Baltimore	10.5 (2)	9.5
Boston	11.5 (2)	10.5
Providence	11.5 (1)	10.5 (2)

HEAVY FUELS & BUNKER OILS (At all Gulf Ports)	In Cargoes	In Ship's Bunkers (Ex. lighterage)
Heavy Diesels		
Below 28 API Grav.	....	$1.35
28 API Grav. & Above	....	$1.65
Bunker C Oil	$0.85–$1.27	$0.85 –$1.27

TANK WAGON PRICES

Commercial or consumer tank car, tank wagon, dealer, and service station prices for gasoline **do not include taxes;** *they do, however, include inspection fees as shown in general footnote. Gasoline taxes, shown in separate column, include 1.5c federal, and state taxes; also city and county taxes as indicated in footnotes. Kerosine tank wagon prices also do not include taxes; kerosine taxes where levied are indicated in footnotes. Dealer discounts are shown in footnotes. These prices in effect Aug. 2, 1943 as posted by principal marketing companies at their headquarters offices, but subject to later correction.*

S. O. New Jersey

Esso (*Regular Grade*)

	Consumer Tank Wagon	Dealer T.W.	Gasoline Taxes	Kerosine T.W.
*Atlantic City, N. J.	10.2	10.7	4.5	10
*Newark, N. J.	10.2	10.7	4.5	10
Annapolis, Md.	10.55	11.05	5.5	....
Baltimore, Md.	9.95	10.45	5.5	10.8
Cumberland, Md.	11.35	11.85	5.5	12.3
Washington, D. C.	10.2	10.7	4.5	11.3
Danville, Va.	11.65	12.15	6.5	12.55
Norfolk, Va.	10.45	10.95	6.5	12.3
Petersburg, Va.	10.75	11.25	6.5	13.3
Richmond, Va.	10.75	11.25	6.5	13.3
Roanoke, Va.	11.95	12.45	6.5	12.8
Charleston, W. Va.	12.25	12.75	6.5	13.6
Parkersburg, W. Va.	11.55	12.05	6.5	13.3
Wheeling, W. Va.	11.55	12.05	6.5	13.9
Charlotte, N. C.	12.1	12.6	7.5	11.6
Hickory, N. C.	12.65	13.15	7.5	12.6
Mt. Airy, N. C.	12.5	13.0	7.5	11.8
Raleigh, N. C.	11.85	12.35	7.5	12.6
Salisbury, N. C.	12.15	12.65	7.5	13.0
Charleston, S. C.	10.95	11.45	7.5	....
Columbia, S. C.	11.8	12.3	7.5	....
Spartanburg, S. C.	12.5	13.0	7.5	....

	Mineral Spirits T.W.	V.M.&P. T.W.
Newark, N. J.	13	14.5
Baltimore, Md.	15.5	....
Washington, D. C.	15.5	....

Fuel Oils—T.W.	No. 1	No. 2	No. 3
Atlantic City, N. J.	10	9	9
Newark	10	9	9
Annapolis, Md.	..	9.25	...
Baltimore	9.8	9	9
Washington, D. C.	10.3	9.4	9.4
Norfolk, Va.	10	8.8	8.8
Petersburg	10.3	9	...
Richmond	10.3	9	9
Charlotte, N. C.	10.6	10.4	...
Hickory, N. C.	....	10	...
Raleigh	11.6	10.1	...
Charleston, S. C.	....	9	...
Columbia	....	10	...
Spartanburg	....	10.8	...

*Effective Aug. 5, '42 minimum retail resale price of 14.2c posted thru New Jersey.

Discounts:

Esso gasoline—to undivided dealers, 0.5c off dealer t.w.

Kerosine—1c off t.w. price for 25 gals. or more, under contract thru territory (Baltimore city contract not necessary) except no discount in state of New Jersey.

Naphthas—To buyers taking following quantities at one time: Newark, 2c per gal. on 200 gals. or more, less than 200 gals. 0.5c higher price; Baltimore, 2c off on 25 to 100 gals. and 3c on over 100 gals.; Washington, 2c off to contract buyers.

Socony-Vacuum Oil Co., Inc.

Socony Mobilgas (*Regular Grade*)

	Com. Cons. T.W.	Indiv. Dlr. T.W.	Gasoline Taxes
New York City	10.1	10.6	*5.5
Manhattan & Bronx	10.1	10.6	*5.5
Kings & Queens	10.1	10.6	*5.5
Richmond	9.7	10.2	*5.5
Albany, N. Y.	9.9	10.4	5.5
Binghamton, N. Y.	11	11.5	5.5
Buffalo	10.2	10.7	5.5
Jamestown, N. Y.	10.4	10.9	5.5
Mt. Vernon, N. Y.	10.1	10.6	5.5
Plattsburg, N. Y.	11	11.5	5.5
Rochester, N. Y.	10.8	11.3	5.5
Syracuse, N. Y.	10.5	11	5.5
Bridgeport, Conn.	10	10.5	4.5
Danbury, Conn.	10.5	11	4.5
Hartford, Conn.	10.6	11.1	4.5
New Haven, Conn.	10	10.5	4.5
Bangor, Me.	10.7	11.2	5.5
Portland, Me.	10.3	10.8	5.5
Boston, Mass.	9.9	10.4	4.5
Concord, N. H.	11.4	11.9	5.5
Lancaster, N. H.	12	12.5	5.5
Manchester, N. H.	11.3	11.8	5.5
Providence, R. I.	10	10.5	4.5
Burlington, Vt.	10.9	11.4	5.5
Rutland, Vt.	11	11.5	5.5

	Mineral Spirits T.W.	V.M.&P. T.W.
Buffalo, N. Y.	12.4	13.6
New York City	11	12
Rochester, N. Y.	13.2	14.4
Syracuse, N. Y.	14	....
Boston, Mass.	12	13
Bridgeport, Conn.	†16.3	†17.3
Hartford, Conn.	†16.3	†17.3
Providence, R. I.	13	14

	Kerosine Yard	Kerosine TW	Mobilfuel Diesel TC	Mobilfuel Diesel TW	Mobilheat Fuel Yard	Mobilheat Fuel TW
New York:						
Manhat'n & Bronx	7.5	10.3	...	9.3	7.1	9
Kings & Queens	7.5	10.3	...	9.3	7.1	9
Richmond	7.5	10.3	...	...	7.1	8.8
Albany	7.5	9.8	7	9.3	7	9
Binghamton	8.9	11.2	...	10.7	8.4	10.2
Buffalo	8.6	10.9	8	10.3	8.2	10
Jamestown	8.7	11	...	10.6	8.3	10
Mt. Vernon	7.6	10.3	...	9.4	7.2	9
Plattsburg	8.1	10.4	...	9.9	7.6	9.4
Rochester	8.7	11	7.9	10.2	7.9	9.7
Syracuse	8.5	10.8	7.8	10.1	7.8	9.6
Conn.:						
Bridgeport	7.8	10.3	...	...	7.2	8.8
Danbury	8.2	10.8	...	...	7.5	8.8
Hartford	8.0	10.5	...	9.5	7.2	9
New Haven	7.8	10.3	...	9.3	7	8.9
Maine:						
Bangor	7.9	10.2	7.4	9.7	7.4	9.1
Portland	7.5	10.2	7	9.3	7	9
Mass.:						
Boston	7.8	10.6	6.9	9.2	7.1	9
N. H.:						
Concord	8.4	10.7	...	...	8.2	10
Lancaster	9.5	11.8	...	...	9.2	11
Manchester	8.5	11.1	...	...	7.9	9.7
R. I.:						
Providence	7.6	9.9	6.9	9.2	7.1	8.9
Vermont:						
Burlington	8.1	10.4	7.5	9.8	7.5	9.2
Rutland	8.3	10.6	...	10	7.7	9.5

*Does not include 1% city sales tax applicable to price of gasoline (ex tax).

†In steel barrels.

Discounts: Diesel—On t.w. deliveries, 0.5c for at least 400 gals.; 1c for full tank truck.

Atlantic Refining

Atlantic White Flash Gasoline (*Regular Grade*)

	Commercial T.W.	Dealer T.W.	Gasoline Taxes	Kerosine T.W.
Philadelphia, Pa.	10.2	10.7	5.5	12.25
Pittsburgh	10.7	11.2	5.5	12.6
Allentown	10.7	11.2	5.5	12.6
Erie	10.7	11.2	5.5	12.6
Scranton	10.7	11.2	5.5	12.6
Altoona	10.7	11.2	5.5	12.6
Emporium	10.7	11.2	5.5	12.6
Indiana	10.7	11.2	5.5	12.6
Uniontown	10.7	11.2	5.5	12.6
Harrisburg	10.7	11.2	5.5	12.6
Williamsport	10.7	11.2	5.5	12.6
Dover, Del.	....	11.2	5.5	12.6
Wilmington, Del.	....	10.7	5.5	12.1
Boston, Mass.	....	10.9	5.5	....
Springfield, Mass.	....	11.8	4.5	....
Worcester, Mass.	....	11.5	4.5	....
Fall River, Mass.	....	11	4.5	....
Hartford, Conn.	....	11.6	4.5	....
New Haven, Conn.	....	11	4.5	....
Providence, R. I.	....	11	4.5	....
Atlantic City, N. J.	....	10.7	4.5	10
Camden, N. J.	....	10.7	4.5	10
Trenton, N. J.	....	10.7	4.5	10
Annapolis, Md.	....	11.05	5.5	10.8
Baltimore, Md.	....	10.45	5.5	9.8
Hagerstown, Md.	....	11.55	5.5	10.3
Richmond, Va.	....	11.25	6.5	12.3
Wilmington, N. C.	....	11.55	7.5	11.9
Brunswick, Ga.	....	10.4	7.5	‡11.1
Jacksonville, Fla.	....	10.4	8.5	12.1

	Mineral Spirits T.W.†	V.M.&P. T.W.†
Philadelphia, Pa.	11	12.5
Lancaster, Pa.	12	13.5
Pittsburgh, Pa.	12.5	13.5

Fuel Oils—T.W.	1	2	3	5	6
Phila., Pa.	10.1	9	9	5.76	5.33*
Allentown, Pa.	10.6	9.3	9.3	....	....
Wilmington, Del.	10.1	9	9	....	....
Springfield, Mass.	10.2	9.4	9.4	....	....
Worcester, Mass.	10.2	9.3	9.3	....	....
Hartford, Conn.	10.5	9	9	....	....

‡Does not include 1c Georgia kerosine tax.

†Mineral Spirits prices also apply to Stoddard Solvent; V.M.&P. prices also apply to Light Cleaners Naphtha.

Discounts:

Gasoline—to undivided dealers, 0.5c off dealer t.w., except Georgia & Florida dealer t.w. and undivided dealer t.w. prices are same.

Kerosine—Thru Penna. & Delaware, 2c off t.w. price on t.w. deliveries of 25 gals. or more at one time.

*Residual fuel 16.0-19.9 gravity.

S. O. Ohio††

***Sohio X-70 Gasoline (*Regular Grade*)**

	Consumer T.W.	**Reselers	‡S.S. Taxes	Gasoline Taxes	†Kerosine T.W.
Ohio, Statewide	12	10	13.5	5.5	9.3
Akron	12	9.5	12.5	5.5	9.3
Cincinnati	12	9.5	12.5	5.5	9.3
Cleveland	12	9.5	12.5	5.5	9.3
Columbus	12	9.5	12.5	5.5	9.3
Dayton	12	9.5	12.5	5.5	9.3
Marietta	12	9.5	12.5	5.5	9.3
Portsmouth	12	9.5	12.5	5.5	9.3
Toledo	12	9.5	12.5	5.5	9.3
Youngstown	12	9.5	12.5	5.5	9.3

Aviation Gasoline—Statewide

	Consumer T.W.	Gasoline Taxes
Sohio aviation grade 65 octane, Spec. AN-VV-F-756	14.5	5.5
Esso Ethyl Aviation 73 Oct.	15.5	5.5
Esso Ethyl Aviation 80 Oct.	16.5	5.5
Esso Ethyl Aviation 87 Oct.(a)	17.5	5.5
Esso Ethyl Aviation 91 Oct.	17.5	5.5
Esso Ethyl Aviation 100 Oct.	24.5	5.5

(a) Effective Oct. 15, 1942.

	†Naphtha—T.W. Statewide	Lucas County
S. R. Solvent	13.5	13.5
D. C. Naphtha	14.5	14.25
V.M.&P. Naphtha	14.5	14.25
Varnolene	14.5	14.25
Sohio Solvent	14.5	14.25

Fuel Oils—T.W.	No.1	No. 2	No. 3	No. 4
Ohio, Statewide	8.3	8.3	7.8	....
Cleveland	10.3	10.3	9.8	7.55

*Renown (third-grade) prices are same as X-70 unless otherwise noted.

**Except authorized agents.

†Kerosine prices are ex 1c state tax. Naphtha prices are ex 1.5c federal & 4c state tax.

‡Prices at company-operated stations.

††Statewide prices are subject to exceptions other than those shown.

Discounts:

Esso aviation—on contract to hangar operators and resellers, 2c off consumer t.w.

Fuel oils—Statewide prices are for t.w. & drum deliveries of 50 gals. or more; prices for deliveries of less than 50 gals. are 0.5c higher. Cleveland Division assumed the state-wide fuel oil tank wagon prices on Nos. 1, 2 and 3 fuel oil, effective May 10. However, the price of 7.55c per gallon on No. 4 fuel oil (full compartment hose dumps only) will remain as heretofore, in Cleveland Division.

Naphthas—to contract consumers off t.w. prices—Statewide: 300 to 999 gals., 0.5c; 1000 to 2499 gals., 0.75c; 2500 to 4999 gals., 1c; 5000 or more gals., 1.5c. Lucas County: Less than 50 gals., tank wagon price, 50 to 249 gals., 0.5c; 250 to 499 gals., 1c; 500 gals. or over, 1.5c.

S. O. Kentucky

Crown Gasoline (*Regular*)
Standard (*Third Grade*)

	†Net Crown	Dealer Standard	Gasoline Taxes	Kerosine T.W.
Covington, Ky.	9.5	....	6.5	9.3
Lexington, Ky.	10.5	8.5	6.5	9.3
Louisville, Ky.	10	....	6.5	8.8
Paducah, Ky.	10	8	6.5	8.8
Jackson, Miss.	10	9	7.5	*9
Vicksburg, Miss.	9.5	....	7.5	*8.5
Birmingham, Ala.	10	9	*8.5	9
Mobile, Ala.	9	....	*9.5	8.5
Montgomery, Ala.	10	9	*9.5	10
Atlanta, Ga.	11.4	..	7.5	*12.1
Augusta, Ga.	11.4	..	7.5	*11.6
Macon, Ga.	11.4	..	7.5	12.1
Savannah, Ga.	10.4	..	7.5	11.1
Jacksonville, Fla.	10.4	..	8.5	10.1
Miami, Fla.	10.4	..	8.5	10.1
Pensacola, Fla.	9	8	*9.5	8
Tampa, Fla.	10.4	..	8.5	10.1

*Taxes: In tax column are included these city and county gasoline taxes: Mobile, 2c city; Birmingham, 1c city; Montgomery, 1c city and 1c county; Pensacola, 1c city. Georgia and Montgomery, Ala. have 1c kerosine tax, Mississippi 0.5c, not included in above prices.

†Consumer t.w. prices are same as net dealer prices.

S. O. Indiana

Red Crown (*Regular Grade*)
Blue Crown (*Third Grade*)

	Red Crown Cons. T.W.	Dealer Prices Red Crown	Blue Crown	Gasoline Taxes	Kerosine T.W.
Chicago, Ill.	10.9	8.9	8.4	4.5	10.6
Decatur, Ill.	10	8.5	8	4.5	9.8
Joliet, Ill.	11.9	9.6	8.5	4.5	10.6

(Continued on next page)

Above prices include these inspection fees on both gasoline and kerosine unless otherwise specified per gallon:
Alabama 1/40c on gasoline, 1/2c on kerosine; Arkansas 1/20c; Florida 1/8c; Illinois 3/100c; Indiana 1/5c in lots of 25 bbls. or less, 2/25c in lots of more than 25 bbls.; Kansas 1/50c; Louisiana 1/32c; Minnesota 7/200c; Missouri 1/50c; Nebraska 3/100c; Nevada, gasoline 1/20c; North Carolina 1/4c; North Dakota 1/20c; Oklahoma 2/25c; South Carolina 1/8c; South Dakota 1/20c; Tennessee 2/5c; and Wisconsin 3/100c.
Kerosine inspection fees only: Iowa 3/50c; Michigan 1/5c per gal.

TANK WAGON PRICES

Commercial or consumer tank car, tank wagon, dealer, and service station prices for gasoline **do not include taxes;** *they do, however, include inspection fees as shown in general footnote. Gasoline taxes, shown in separate column, include 1.5c federal, and state taxes; also city and county taxes as indicated in footnotes. Kerosine tank wagon prices also do not include taxes; kerosine taxes where levied are indicated in footnotes. Dealer discounts are shown in footnotes. These prices in effect Aug. 2, 1943 as posted by principal marketing companies at their headquarters offices, but subject to later correction.*

(S. O. Indiana Cont'd)

Red Crown (*Regular Grade*)
Blue Crown (*Third Grade*)

	Red Crown Cons. T.W.	Dealer Prices Red Crown	Blue Crown	Gasoline Taxes	Kerosine T.W.
Peoria, Ill.	11.7	9.2	9.1	4.5	10.4
Indianapolis, Ind.	11.6	9.7	9.6	5.5	*10.1
Evansville, Ind.	11.4	9.9	7.9	5.5	*9.9
South Bend, Ind.	12	10.5	10	5.5	*10.5
Detroit, Mich.	11.4	9.9	9.4	4.5	10
Grand Rapids, Mich.	10.8	9.3	8.8	4.5	9.9
Saginaw, Mich.	11.4	9.9	9.4	4.5	9.9
Green Bay, Wis.	12.2	10.7	10.2	5.5	10.9
Milwaukee, Wis.	12.1	10.6	10.1	5.5	10.8
La Crosse, Wis.	11.9	10.4	9.9	5.5	10.6
Minneapolis-St. Paul	11.9	10.4	9.5	5.5	10.6
Duluth, Minn.	12.2	10.7	10.2	5.5	10.9
Mankato, Minn.	11.9	10.4	9.5	5.5	10.6
Des Moines, Ia.	11.4	9.9	9.4	4.5	*10.1
Mason City, Ia.	11.7	10.2	9.7	4.5	*10.4
St. Louis, Mo.	10.3	8.8	8.6	*4.5	10.1
Kansas City, Mo.	10.4	8.9	7.9	*4.5	9.7
St. Joseph, Mo.	11.2	9.7	8.7	*4.5	9.9
Fargo, N. D.	12.9	11.4	10.5	5.5	11.6
Huron, S. D.	12.3	10.8	10.3	5.5	11
Wichita, Kans.	9.7	8.2	6.5	4.5	8.3

Stanavo Aviation 73 Octane

Chicago, Ill.	15.7	4.5
Milwaukee, Wis.	15.9	5.5
Minneapolis, Minn.	15.7	5.5
St. Louis, Mo.	15.2	*4.5
Kansas City, Mo.	14.8	*4.5
Fargo, N. D.	16.7	*5.5
Huron, S. D.	16.1	5.5

	Oleum Spirits	V.M.&P. Naphtha	Stanisol	*Taxes
(Prices are base prices before discounts)				
Chicago	13.5	13.8	12.8	4.5
Detroit	15.8	15	16.3	4.5
K. C., Mo.	13.3	14.3	13.8	1.5
St. Louis, Mo.	13.7	14.7	13.2	1.5
Milwaukee	14.4	15.4	14.9	5.5
Minneap'lis	14.2	15.2	13.5	5.5

Fuel Oils T.W.
Chicago

	Standard Heater Oil
1-99 gals.	9.3
100-149 gals.	8.3
150 gals. & over	7.8

	Stanolex Fuel Oil No. 1	Stanolex Furnace Oil
1-99 gals.	8.8	8.8
100-149 gals.	7.8	7.8
150-399 gals.	7.8	7.8
400 gals. & over	7.3	7.3

	Stanolex Fuel Oil A	Stanolex Fuel Oil B
1-99 gals.	8.3	8.3
100-399 gals.	7.3	7.3
400-749 gals.	6.3	6.3
750 gals & over	5.55	5.55

	Stanolex Bunker C Fuel Oil
1-399 gals.	6.8
400-999 gals.	5.8
1000 gals. & over	4.8

Other Points	Stanolex Furnace Oil
Indianapolis	
1-99 gals.	9.0
100 gals. & over	8.0
Detroit	
1-99 gals.	8.7
100 gals. & over	7.7
Milwaukee	
1-99 gals.	9.0
100 gals. & over	8.0
Minneapolis	
1-99 gals.	9.1
100 gals. & over	8.1
St. Louis	
1-99 gals.	8.1
100 gals. & over	7.1
Kansas City	
1-99 gals.	8.1
100 gals. & over	7.1

*Taxes: In gasoline tax column are included these city taxes—Kansas City, St. Joseph, and St. Louis, 1c. Iowa kerosine prices are ex 3c state tax. In naphtha tax column are included 1.5c federal tax and state taxes.

State sales, occupation, consumer and use taxes to be added when applicable.

S. O. Nebraska

(*Regular Grade*)

	T.W. Dealer	Gasoline Taxes	Kerosine T.W.
Omaha	11.4	8.9	6.5	10.1
McCook	12.0	9.4	6.5	9.8
Norfolk	11.9	10.4	6.5	10.6
North Platte	12.3	9.9	6.5	11
Scottsbluff	12.4	9.5	6.5	9.8

S. O. Louisiana

Esso Gasoline (*Regular Grade*)

	Consumer Tank Wagon	Dealer T.W.	Gasoline Taxes	Kerosine T.W.
New Orleans, La.	8.75	9.25	8.5	*9
Baton Rouge, La.	8.75	9.25	8.5	*9.5
Alexandria, La.	8.75	9.25	8.5	*9.5
Lafayette, La.	9	9.5	8.5	*9
Lake Charles, La.	9	9.5	8.5	*11
Shreveport, La.	8.5	9	8.5	*8
Knoxville, Tenn.	9.5	10	8.5	12.5
Memphis, Tenn.	8.90	9.40	8.5	10.5
Chattanooga, Tenn.	10.5	11	8.5	11
Nashville, Tenn.	10.5	11	8.5	10
Bristol, Tenn.	10.95	11.45	8.5	13.1
Little Rock, Ark.	9.5	10	8	10

*Louisiana kerosine prices are ex 1c state tax.

Discounts:

Esso Gasoline—To undivided dealers, 0.5c off dealer t.w.

Humble Oil & Refining Co.

Humble Motor Fuel (*Regular Grade*)
Thriftane (*Third Grade*)

	Humble *Tank Wagon	Humble Retail	Thriftane *Tank Wagon	Thriftane Retail	Gasoline Taxes
Dallas, Tex.	7.5	10.5	6.5	8.5	5.5
Ft. Worth, Tex.	6.5	9.5	6	7.5	5.5
Houston, Tex.	8.5	12.5	7.5	10.5	5.5
San Antonio, Tex.	8.5	12.5	7.5	10.5	5.5

	Kerosine *Tank Wagon	Kerosine Retail
Dallas, Tex.	7	10
Ft. Worth, Tex.	7	11
Houston, Tex.	8	11
San Antonio, Tex.	7	10

73 Oct. Aviation Gasoline	Tank Car
FOB Baytown, Tex.	8.5

*To all classes of dealers & consumers.

The Texas Co.

	Gasoline—Dealer T.W. Fire-Chief (*Regular*)	Indian (*3rd Grade*)	Gasoline Taxes
Dallas, Tex.	7.5	6.5	5.5
Ft. Worth, Tex.	6.5	6.0	5.5
Wichita Falls, Tex.	8.5	7.5	5.5
Amarillo, Tex.	8.5	7.5	5.5
Tyler, Tex.	8.5	7.5	5.5
El Paso, Tex.	11	10.5	5.5
San Angelo, Tex.	8.5	7.5	5.5
Waco, Tex.	8*	7*	5.5
Austin, Tex.	8.5	7.5	5.5
Houston, Tex.	8.5	7.5	5.5
San Antonio, Tex.	8.5	7.5	5.5
Port Arthur, Tex.	8.5	7.5	5.5

*Less 1c temporary allowance to all dealers.

Continental Oil Co.

(N.B. Prices are Continental's "structural" prices. Prices do not reflect temporary reductions made to meet local competition).

	Conoco Bronz-z-z (*Regular*) †Tank Wagon	Demand (*3rd Grade*)	Gasoline Taxes	Kerosine T.W.
Denver, Col.	11	10	5.5	11
Grand Junction, Col.	12	11	5.5	12
Pueblo, Col.	10.5	9.5	5.5	10.5
Casper, Wyo.	11.5	10.5	5.5	12
Cheyenne, Wyo.	11	10	5.5	11.5
Billings, Mont.	12.5	11.5	6.5	12.5
Butte, Mont.	13.5	12.5	6.5	13.5
Great Falls, Mont.	12.5	11.5	6.5	12.5
Helena, Mont.	13	12	6.5	13
Salt Lake City, Utah	13.5	12.5	5.5	14.5
Boise, Ida.	14.1	13.1	6.5	16.5
Twin Falls, Ida.	15.6	14.6	6.5	17
Albuquerque, N. M.	10	9	*7	9.5
Roswell, N. M.	9.5	8.5	*7	9
Santa Fe, N. M.	10.5	9.5	*7.5	10
Ft. Smith, Ark.	9.5	9.25	*7	9.5
Texarkana, Ark.	9	8	*5.5	9
Muskogee, Okla.	9.5	8.5	7	8.5
Oklahoma City, Okla.	9.5	8.5	7	8.5
Tulsa, Okla.	9.5	8.5	7	8.5

*Taxes: In gasoline tax column are included these city taxes—Albuquerque, & Roswell, 0.5c; Santa Fe, 1c. Texas 4c state tax applies within city limits of Texarkana, Ark.; Okla. 5.5c state applies within city limits of Ft. Smith, Ark.

†To consumers & dealers.

S. O. California

Standard Gasoline (*Regular Grade*)
Flight Gasoline (*Third Grade*)

	Standard Posted Net Tank Truck	Standard Posted Retail	Flight Posted Net Tank Truck	Flight Posted Retail	Gasoline Taxes
San Francisco, Cal.	10	14	9	12	4.5
Los Angeles, Cal.	9.5	13.5	8.5	11.5	4.5
Fresno, Cal.	11	15	10	13	4.5
Phoenix, Ariz.	12	16	10	13	6.5
Reno, Nev.	12	16	11	14	5.5
Portland, Ore.	10.5	14.5	9.5	12.5	6.5
Seattle, Wash.	10.5	14.5	9.5	12.5	6.5
Spokane, Wash.	12.5	16.5	11.5	14.5	6.5
Tacoma, Wash.	10.5	14.5	9.5	12.5	6.5

Std. Aviation 73

	Posted Net Tank Truck	Gasoline Taxes	Kerosine Tank Truck
San Francisco, Cal.	12.5	4.5	11.5
Los Angeles, Cal.	12	4.5	10
Fresno, Cal.	13.5	4.5	12.5
Phoenix, Ariz.	14.5	6.5	12.5
Reno, Nev.	14.5	5.5	13.5
Portland, Ore.	13	6.5	13.8
Seattle, Wash.	13	6.5	13.8
Spokane, Wash.	16	6.5	16.8
Tacoma, Wash.	13	6.5	13.8

Resale & Commercial: T.C. deliveries 0.25c per gal. off posted net tank truck.

Commercial: Retail deliveries, and/or tank truck deliveries of less than 40 gals., 4c per gal. above posted net tank truck price for Standard Aviation and Standard Gasoline, and 3c per gal. above posted net tank truck for Flight Gasoline, except single deliveries of less than 40 gals. to Marine trade only, which are billed at posted net tank truck price.

Canada

PRICES ON IMPERIAL OIL, LTD.

Per Imperial Gallon, which is 1.2 U. S. Gallons

3-Star Imperial Gasoline (*Regular Grade*)

	†Gasoline T.W.	*Gasoline Taxes	†Kerosine T.W.
Hamilton, Ont.	17.5	11	18
Toronto, Ont.	17.5	11	18
Brandon, Man.	21	10	23
Winnipeg, Man.	20.5	10	22.5
Regina, Sask.	18	10	20
Saskatoon, Sask.	20.8	10	22.8
Edmonton, Alta.	18.9	10	20.9
Calgary, Alta.	16	10	18
Vancouver, B. C.	15	10	24
Montreal, Que.	17	11	17.5
St. John, N. B.	16.5	13	19
Halifax, N. S.	16.5	13	19

*Includes 3c Federal, and Provincial taxes.

†To divided & undivided dealers.

Above prices include these inspection fees on both gasoline and kerosine unless otherwise specified per gallon:

Alabama 1/40c on gasoline, 1/2c on kerosine; Arkansas 1/20c; Florida 1/8c; Illinois 3/100c; Indiana 1/5c in lots of 25 bbls. or less, 2/25c in lots of more than 25 bbls.; Kansas 1/50c; Louisiana 1/32c; Minnesota 7/20c; Missouri 1/50c; Nebraska 3/100c; Nevada, gasoline 1/20c; North Carolina 1/4c; North Dakota 1/20c; Oklahoma 2/25c; South Carolina 1/8c; South Dakota 1/20c; Tennessee 2/5c; and Wisconsin 3/100c.

Kerosine inspection fees only: Iowa 3/50c; Michigan 1/5c per gal.

Dormant Equipment can Work or Fight - -
IF YOU CAN'T FIND A USE FOR IT, *Scrap it!*
WAR-OIL EQUIPMENT EXCHANGE

For Sale

DAVIS TRAILER, 7 compartment, 2550 gallons capacity, with air brakes and fifth wheel, good tires. $1050. Oil City Refiners, Inc., 4800 Warner Rd., Cleveland, Ohio.

FOR SALE

Complete Highway type combination retail filling station and bulk plant approximately one mile from city limits of Waterloo, Iowa. Practically new equipment consisting of two 10,000 gallon vertical storage tanks, gasoline pumps, air compressor, etc. Direct inquiries to

P. O. Box 153
Clayton 5, Missouri

37—30,000 barrel oil storage tanks. Former property of the Ohio Oil Company, located Findlay, Ohio. Will sell as tanks or plates. Will dismantle, match-mark and load on cars. Phone, wire or write,

Plant and Equipment Purchasing Company,
1300 Fountain Square Building, Main 2142,
Cincinnati 2, Ohio

FOR SALE

Used Truck Tanks of the following manufacture. Heil, Davis, Robinson and Quaker City, 4 compartment, side can racks, rear can box, capacity 850, 1000 and 1200 gallon. Also used Air Compressors, ½ to 5 H.P. and other new and used Bulk Plant and Service Station Equipment.

Harold G. Anderson Equipment Distributors
177 Watervliet Ave. Albany 5, N. Y.

FOR SALE

1 Carbondale Wax Press, 250 plates, 48″ diameter, ½″ ring.

1 Complete (less refrigeration) Sharples Centrifuge Bright Stock Dewaxing Plant, which includes four inclosed type Sharples Centrifuges; two 1,000 barrel Carbondale Chilling Tanks; one 1,000 barrel Mixing Tank. Also miscellaneous Accumulator Tanks and all necessary Centrifugal Brine and Water Circulating and Transfer Pumps, all in excellent condition.

1 150 HP-125 P.S.I.-H.R.T. Titusville Iron Works Boiler, equipped with Iron Fireman.

3 150 HP-125 P.S.I.-H.R.T. Titusville Iron Works Boilers, no stokers. All Boilers will pass Pennsylvania inspection.

1 Columbus Conveyor Company Coal Lift and Conveyor.

3 1500 barrel 30′ diameter x 12′ high wood roof storage tanks.

2 750 barrel 30′ diameter x 6′ high wood roof Kerosene Bleaching Tanks.

1 G.E. (AC) 57 K.V.A. Electric Generator, direct connected to 85 HP Cooper-Bessemer Oil Engine. Also panel board and air starting unit.

13 5 ton pressure Oil Filters.

14 2½ ton pressure Oil Filters.

2 7″ x 8″ Triplex Pumps with motors.

1 Small Machine Lathe, suitable for light work.

1 Agitator, 300 barrel capacity, not lined.

Material located at Oil Creek Refining Company's plant, Titusville, Pennsylvania. Address all inquiries to

Allegany Refiners, Inc.,
Bolivar, New York

Wanted to Buy

Wholesale Gasoline and Oil Distributing business, give monthly sales on all products for past 18 months, trade name of products handled, distance of hauls, average gallons delivered to customer per trip, plant facilities, tank-truck and service station equipment, real estate properties owned or leased, population of cities and towns served and size of territory, jobber or commissioned operated. Prefer a location between Richmond, Va. and Miami, Fla. Give price and other particulars pertaining to operation.

Box No. 263

To Trade

One 1500-gallon Heil, streamlined, 6-compartment, gasoline truck tank, with truck if desired, for a modern 1000-gallon fuel oil truck; must be in A-1 condition. W. E. Silkworth, Ypsilanti, Michigan.

For Sale or Lease

SALE or LEASE: Grease Manufacturing Plant, Atlantic Seaboard, now operating, 1—2750 gallon, 2—750 gallon fully jacketed kettles, 1—10,000, 4—1500 gallon, and smaller tanks, metered steam 150 pounds pressure, low rent, long lease, no frills, ideally adapted for grease making or oil compounding. Box No. 267.

Situations Open

WANTED, REFINERY OPERATORS who have had stillman or supervisory experience in modern oil refineries. Give refining background and complete experience record. Location Houston, Texas. Send reply to Box No. 252 in care of this magazine.

Opportunity as Department Head Awaits Experienced Lubrication Engineer Who Can Promote Sales

Man to head Lubrication Department major oil company, extensive manufacturer and marketer lubricants Middle West. Must be a lubrication engineer and market analyst with actual selling experience. An opportunity for a well-rounded-out expert in automotive, Diesel and plant lubrication, possessing experience, an inquiring mind and temperamentally equipped to win and hold the confidence and respect of associates. Apply Box No. 264, National Petroleum News, Cleveland, Ohio.

• • • • WANTED • • • •

Major oil company with continent-wide operations and research seeks graduate technical men of the following qualifications:

MECHANICAL ENGINEERS—with petroleum refinery or similar experience. Should be familiar with refinery design, estimating, construction, mechanical equipment, engineering materials, and utilities systems. Process knowledge desired although not essential.

CHEMISTS AND CHEMICAL ENGINEERS interested in research, design, or plant operation. Should have training and experience in refinery or other industrial organizations.

Work not of a temporary nature. In reply state experience, education, age, marital status, draft classification and salary expected, include small snapshot (not returnable). Replies strictly confidential. Applicants now employed at highest skill in war industries not solicited. Box No. 249, National Petroleum News, Cleveland, Ohio.

National Petroleum News

Copyright 1943 by The National Petroleum Publishing Co.

Trade Mark Registered U. S. Patent Office
Published every Wednesday by
The National Petroleum Publishing Co.

WARREN C. PLATT, *Editor and Publisher*
V. B. GUTHRIE, *Managing Editor*

Member of Audit Bureau of Circulation and Associated Business Papers Inc.

Publication office: 1213 W. Third St., Cleveland 13, Ohio, U. S. A. Telephone, CHerry 7672. Cable Address PLATTOIL, Cleveland. Cable inquiries are answered by mail unless subscriber advances sufficient funds in American money to cover our cable costs.

NEWS BUREAUS

New York 20, 50 W. 50th street, Telephone Columbus 5-1516 and 5-1517.

Washington 4, D. C., 1034-36-38 National Press Bldg., Telephone, NAtional 3477.

Tulsa 3, Okla., 904 World Bldg., Telephone 3-7132.

Los Angeles 14, 610-A Hillstreet Bldg., Telephone VAndike 2845.

Chicago 5, 59 E. Van Buren Street, Telephone, Harrison 5901-2-3.

Subscription rate $5 per year in United States, Mexico and Pan-American Countries; $6.50 in Canada and Foreign Countries. Current copies 20 cents, except special issues; back copies more than two months old 30 cents per copy.

Positions Wanted

INDUSTRIAL LUBRICATION
SALES MANAGER AND ENGINEER

Fifteen years experience plant lubrication, engineering and management of industrial salesmen. Seeks connection in states of California, Oregon or Washington. Thoroughly experienced in plant processing. Draft exempt. References.

Address Box No. 265
National Petroleum News

SALES EXECUTIVE

offers 18 years of marketing experience, both Wholesale and Retail, as Sales Supervisor, Wholesale Salesmanager and Division Manager. Draft exempt and married. Excellent references.

Address Box No. 266

Professional Services

ANTI-KNOCK VALUES DETERMINATORS
The Gray Industrial Laboratories
Chemists and Engineers
Specialists on Petroleum Products
961-976 Frelinghuysen Ave.,
NEWARK, N. J.
Telephone Bigelow 3-4020

ADVERTISERS' INDEX

This index is published as a convenience to the reader. Every care is taken to make it accurate, but National Petroleum News assumes no responsibility for errors or omissions.

American Flange & Mfg. Co.	23
Badger & Sons Co., E. B.	19
Blackmer Pump Co.	39
Brodie Co., Ralph N.	Inside Front Cover
Chevrolet Motor Co.	27
Crown Can Co.	15
Ethyl Corp.	1
Gilbert & Barker Mfg. Co.	Outside Back Cover
Goodyear Tire & Rubber Co.	17
Graver Tank & Mfg. Co.	31
Gulf Oil Corp.	25
Houdry Process Corp.	21
Pennsylvania Grade Crude Oil Association	33
Platt's War Oil Communications	35-Inside Back Cover
Shell Oil Co.	29

About OIL PEOPLE

Mr. Anderson Mr. Garrabrant

The Atlantic Refining Co. announced August 3 the retirement of **William Downs Anderson** as a director, vice-president and general manager of foreign sales. He had held the offices since 1923. Mr. Anderson was succeeded as general manager of foreign sales by **A. A. Garrabrant,** a director and vice-president, who has been acting as assistant manager.

Mr. Anderson was born in Philadelphia Feb. 12, 1874 and attended Girard college, Drexel Institute and the Wharton School of the University of Pennsylvania. He became associated with Atlantic in 1898 and also had served the company as assistant secretary and secretary.

° ° °

E. B. Reeser, for the past 18 years president of Barnsdall Oil Co., retired Aug. 1, to be succeeded by **James A. Dunn,** according to an announcement made by **W. C. Whaley,** vice-president of Barnsdall and newly appointed general manager of their California division.

Both the outgoing and incoming presidents are pioneer oil men—Mr. Reeser having been in the petroleum industry for 50 years, 40 of which he spent with Barnsdall. Mr. Dunn was associated with the company since the days of **T. N. Barnsdall,** its founder. Mr. Dunn became secretary and vice-president of Barnsdall in 1926.

° ° °

James A. (The Sheriff) McEwan finished his 49th year with Swan-Finch Oil Co., New York City, on Aug. 1. He started as office boy, worked in the sales department and later was purchasing manager. He is now purchasing agent for Swan-Finch.

° ° °

T. J. Hanrahan, for some time past in the marketing department of the Sinclair Refining Co. at Montgomery, Ala., was transferred August 1 to Charlotte, N. C., where he will continue as state merchandising representative for Sinclair.

R. R. Risser, special representative, Continental Oil Co., was a recent Cleveland visitor. "Just looking things over, getting some first-hand authentic market news from NPN and to enjoy an overnight boat trip from Detroit," was Rissert's explanation for being off his "beat".

° ° °

William L. Naylor, assistant controller of Gulf Oil Corp., has been elected president of the Pittsburgh Control of the Controllers Institute of America.

° ° °

First Lieut. William Minder, 23, of St. Paul, Minn., serving with the United States Army 8th Air Force, has been promoted to captain after receiving two air awards, the Distinguished Flying Cross and the Oak Leaf Cluster to the Air Medal. He is the son of **Mr. and Mrs. Oscar H. Minder,** St. Paul, and before entering the air corps was associated with his father in the Inter-State Oil Co., Inc., Minneapolis.

° ° °

Ralph King, prominent Wisconsin oil jobber, was married July 14 to Miss Ruth Augustyn, daughter of Mr. and Mrs. Godfrey W. Augustyn, Milwaukee. Mr. King is president of the Diamond Oil Co., Racine.

° ° °

Vice-President Hines H. Baker of the Humble Oil and Refining Co. has announced the appointment of former **Superintendent Gordon L. Farned** as plants manager, and former **Assistant General Superintendent James Harrop** as general superintendent of the company's Baytown, Tex., plants.

° ° °

Paul Pigott, Seattle, president of the Pacific Car and Foundry Co., has been elected a director of the Standard Oil Company of California.

° ° °

R. W. Heath, manager of the gas department for the Signal Oil & Gas Co. has been elected president of the California Natural Gasoline Assn. **C. D. Gard** of the Union Oil Co. of California was elected vice-president and **George L. Tyler** remained as secretary-treasurer.

° ° °

Mayben P. Newby, local auditor of the Skelly Oil Co., has been elected president of the Kansas City Control of the Controllers Institute of America.

° ° °

J. F. Koellisch, former advertising agency account executive and trade journal editor, has been named advertising and sales promotion manager of L. Sonneborn Sons, Inc., New York, oil refiners and manufacturing chemists.

Frank E. Holsten, New Orleans, Chalmette Petroleum Co. vice-president, has been re-elected president of Gulf Coast Refiners Assn. Other officers re-elected include **J. A. Bartlett,** Corpus Christi, American Mineral Spirits Co. and **G. O. Irvine,** Houston, American Republics Corp., as vice-presidents; **L. F. Rothermel,** Houston, Maritime Oil Co., treasurer, and **George Reid,** executive secretary.

Mr. Holsten will continue to represent G. C. R. A. on the PIWC and certain of its committees, and to serve on PAW's District 3 refining committee and certain sub-committees.

° ° °

Dr. R. H. Waser, Houston, manager of Shell Oil Co.'s Deer Park refinery, has been transferred to the New York office as manager of manufacturing operations effective August 1. He will be succeeded by **P. E. Foster,** present manager of Shell's Norco, La., refinery.

° ° °

Lt. (j.g.) Amos K. Smith, U. S. N. R., resigned from Standard Oil of Indiana to accept a commission in the Navy and is now acting as an assistant to the Inspector of Naval Material at Chicago. Lt. Smith joined Standard in 1932; held the position of wholesale sales manager at Detroit and later of analyst on the staff of the general manager of sales for Standard at Chicago.

° ° °

F. P. Dodge, for the past four years works manager of the Texas company's Port Arthur refinery, has been appointed assistant to the general manager of the refining department. He has been assigned to special duties, and will remain in Port Arthur.

Mr. Dodge's appointment was announced in New York by **M. Halpern,** Texas vice president in charge of refining.

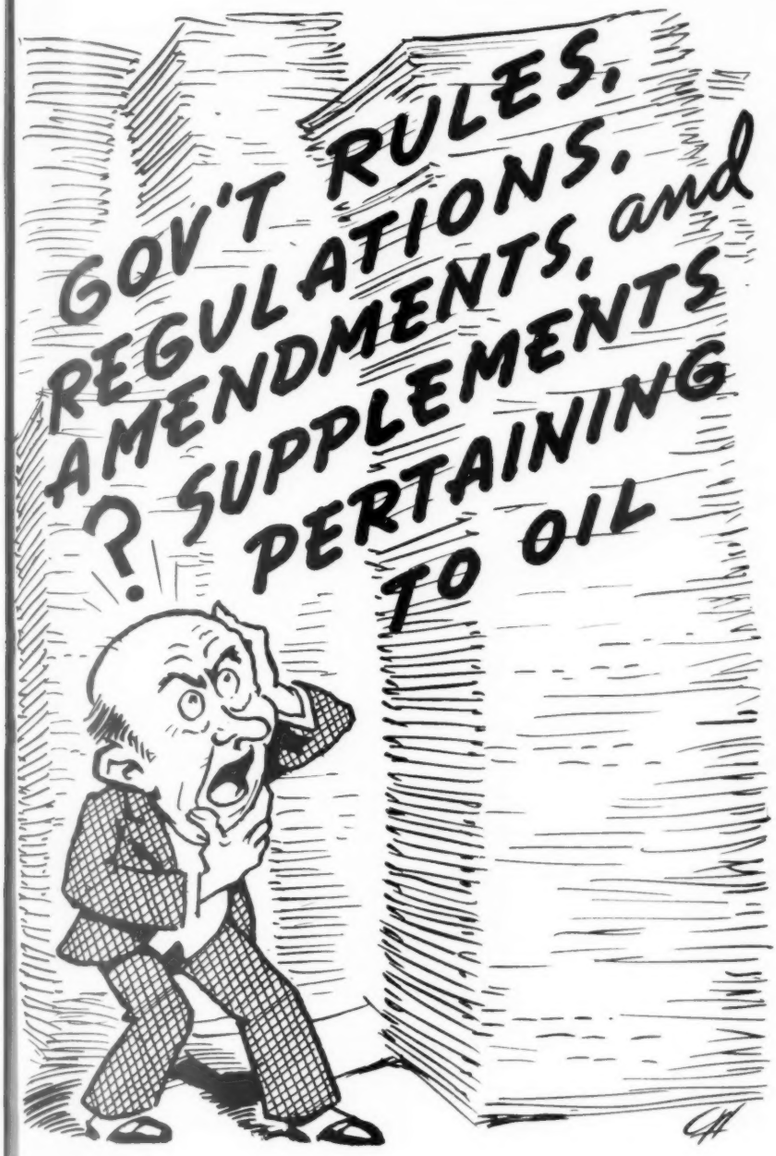
Mr. Halpern also announced that **F. L. Wallace,** general superintendent at Port Arthur since May, 1939, has been named works manager. Replacing Mr. Wallace as general manager is **D. P. Bailey,** who returns to the Texas company from a period of service with PAW.

° ° °

George L. Noble, Jr., Houston, Tex., has been appointed regional director of WPB's headquarters at Dallas succeeding **Eugene Risser.** Mr. Risser returned to the Southwest Pump Co., Bonham, Tex., which he left in July, 1942, when the WPB regional offices were being established.

Prior to 1941, Mr. Noble was an independent oil operator in East Texas and Louisiana and was formerly vice-president of Western Petroleum Corp.

IT'S CONFUSING— NOT AMUSING!



When the 23 government agencies in Washington constantly keep issuing new rules, regulations, orders, supplements, amendments and interpretations regarding the oil industry.

The oil man, nevertheless, must keep up-to-date with the laws regarding his industry. Difficult, though it seems . . . it can be done easily, if he follows each issue of Platt's Oil-LAW-Gram.

For, Platt's Oil-LAW-Gram gives the oil man the complete text on all government orders affecting the oil industry,—immediately after they are released by the agencies. This daily law service comes in a loose-leaf ring binder. To simplify reference, an index is issued monthly.

Every oil executive, with this valuable legal information at his elbow for instant reference, will be able to make important decisions regarding his business operations—decisions that will conform to the law of the day.

If you are one of this group, and would like to investigate this service, fill out the coupon below and mail it to us today. This will bring you a one week's free trial to Oil-LAW-Gram. You will be under no obligation.

PLATT'S

OIL-Law-GRAM

REPORTS

3-month subscription – via first class train mail	$19.50
3-month subscription – via air mail	$21.38
1-year subscription – via first class train mail	$75.00
1-year subscription – via air mail	$82.50

3405 pages of Oil-LAW-Gram reports have come off the press since May 28, 1941, when the President issued his executive order establishing the OPC.

1249 issues of the Oil-LAW-Gram containing from one to thirty pages were required to report the word-for-word text of this huge mass of material.

310 orders—PLUS—amendments, interpretations, instructions, clarifications and reports of policy—covering all the various phases of producing, refining, transportation and distribution of petroleum products, have been issued by the twenty-three governmental agencies having jurisdiction over the industry to date, and the tide of legal restrictions and limitations keeps rising higher every day.

15 complete and carefully edited and arranged INDEX PAGES make it easy for you to find your way to just what you want in the 3405 pages of legal data which now comprise a complete set of Platt's Oil-LAW-Gram Reports.

Platt's

Platt's War-Oil Communication Services, 8443
1213 West Third Street, Cleveland, 13, Ohio

Please send me, free of all charges, a full week's trial subscription to Platt's Oil-LAW-Gram.

Name .....

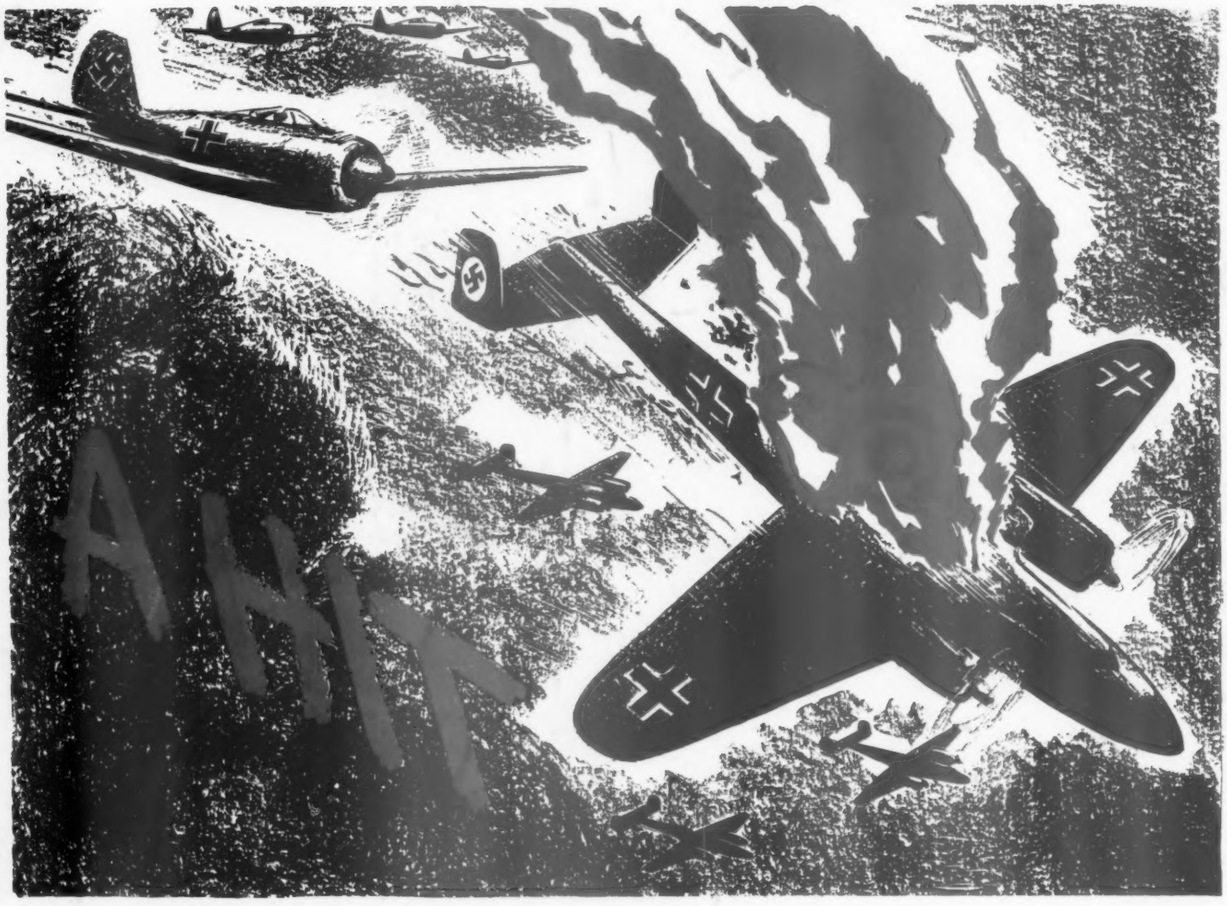
Title .....

Name of Company .....

Street Address .....

City ..... State .....

WAR-OIL COMMUNICATION SERVICES



...THAT BRINGS THE FUTURE ONE STEP NEARER!

The men behind our guns at the front get a super-kick out of a split-second burst that spatters a Heinkel or Zero all over the sky.

And we here at Gilbarco share something of their satisfaction, when we read of enemy plane losses caused by deadly accurate ack-ack fire. For we build some of the controls that make such accuracy possible.

The thrill is intensified by the realization that every bull's-eye brings peace that much closer, and with it all the wonders of constructive achievement on the highway and in the home, toward which we shall turn when the last shot is fired.

ARMY E NAVY

Gilbarco

GILBERT & BARKER MANUFACTURING CO. • WEST SPRINGFIELD, MASS. • TORONTO, CANADA

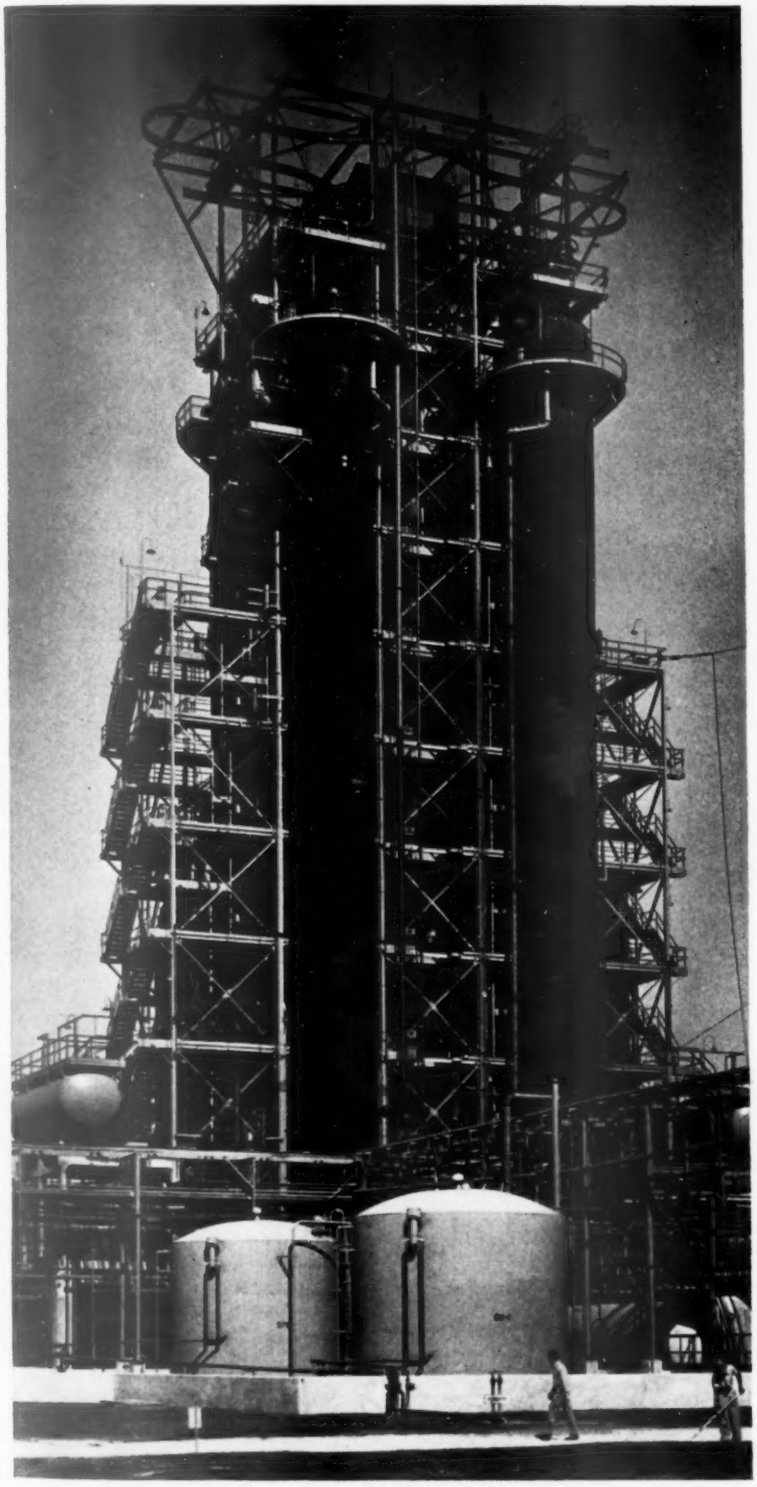
NATIONAL PETROLEUM NEWS

Monthly Technical Section Devoted to

REFINERY MANAGEMENT and PETROLEUM CHEMICAL TECHNOLOGY

TECHNOLOGY DEPT. AUG 6 - 1943

Volume 35 | August 4, 1943 | Number 31



Improving Products from West Texas And Other High-Sulfur Crudes

Established methods are available for neutralizing contaminants to check corrosion of refinery equipment and for lessening sulfur content of products, including improving octane number and lead susceptibility of gasolines **R-339**

Relining Valves and Repairing Heat Exchangers by Electric Welding

Methods in practical use by two refiners are described, for lengthening the wartime service of this critical equipment **R-350**

Chemical Structure and Properties Of Commercial Synthetic Rubbers

Condensed listing for reference purposes also includes present status of manufacture, methods of vulcanizing and processing, and commercial uses of many individual rubbers.. **R-368**

90,000-Ton Synthetic Rubber Plant Built in Multiples of Units

Thus the same design can be duplicated for smaller government rubber plants, and also breakdown in one unit will not force wide shutdown in operations **R-358**

Overall Plate Efficiency of Columns As a Function of Viscosity

By H. G. Drickamer and J. R. Bradford .

Correlation developed from test data on refinery fractionating columns has practical application in process design calculations **R-378**

212-ft. distillation towers in the new styrene plant of Monsanto Chemical Co. at Texas City, Tex., where a large part of the styrene required in the government's synthetic rubber program will be manufactured. The styrene is made by alkylation of ethylene and benzene into ethylbenzene, followed by dehydrogenation to styrene. Distillation provides the high degree of purity of product required

---

'Pioneer' Heads West Coast Natural Gasoline Makers

Ronald W. Heath

Still young in years, the new president of the California Natural Gasoline Assn. has been active in the work of this organization since it was formed in 1926. He served on one of its first technical committees, appointed to develop the charcoal test for gasoline content of gases. He has maintained an active interest as a member of its Executive Committee.

A native Californian, Mr. Heath interrupted his studies in engineering at Stanford University to serve as a lieutenant in the U. S. Air Force in the first World War. After returning to graduate, he started work in 1923 in the laboratory of a company operating one of the first natural gasoline absorption plants in California. He continued as engineer, superintendent, and finally manager of the gas department for the same interests, now the Signal Oil and Gas Co. His home is on the ocean front at Long Beach.

The California Natural Gasoline Assn. has grown to a group of over 500 members, holds monthly meetings, has published 15 standards bulletins and its technical committees are working on additional standards and tests. C. D. Gard, Los Angeles, Union Oil Co., is vice-president, and George L. Tyler continues as secretary-treasurer.

REFINERY MANAGEMENT *and* PETROLEUM CHEMICAL TECHNOLOGY

Aug. 4, 1943
Volume 35
Number 31

A MONTHLY TECHNICAL SECTION OF NATIONAL PETROLEUM NEWS *incorporating International Petroleum Technology*

Improving Products from 'Sour' Crudes

724
791

Established Methods for Reducing Sulfur Content of Products, Improving Octane Number and Lead Susceptibility of Gasolines, and Neutralizing Corrosive Nature of the Crude Itself are Reviewed in Light of Growing Need for More Plants to Run West Texas and Other High-Sulfur Oils.

"HOW CAN a refiner run high-sulfur crude in a plant not built for it?" is a question today engaging the serious attention of a number of oil companies.

They face the necessity of finding substitutes for a dwindling supply of "sweet" crude, and so-called "sour" crudes, notably those of West Texas, from a national viewpoint, are the only ones not now being produced and utilized to the fullest extent. It is accepted that there can be produced additional supplies of West Texas crudes, output of which fields is now about 250,000 bbls. a day; and means are being studied for making them available to a number of plants which have not heretofore used them. In other fields, limited amount of high-sulfur crudes, which have not previously been desired by refiners, will be sought by certain companies.

The problem of handling high-sulfur crudes should properly be considered under three headings:

First, how to run sour crude leaving the sulfur in it.

Second, how to remove the sulfur from the oil before the refiner processes it.

Third, what is the effect of the sulfur if it remains in the gasoline, fuel oil, lubricants and other products.

No Process for Desulfurizing Crude

The first procedure named above is the only one at present feasible, according to most refiners, since there is at present no generally known practicable method for satisfactorily removing sulfur compounds from crude before processing. Many research groups have been working for years to develop such a method, but they have so far reported little in the way of positive results. As has happened in so many cases within the petroleum refining industry alone, the wartime necessity will stimulate and inspire work on this problem, and a solution may be forthcoming even in the near future.

Sulfur exists in crude oil in many diversified forms, including hydrogen sulfide, mercaptans, alkyl sulfides, disulfides, polysulfides, aromatic sulfides, thiophanes, carbon disulfides and thiophenes. It is not difficult to remove hydrogen sulfide, as this can be done by simple topping to well below safe limits in many cases. Some of the mercaptans may be removed by relatively simple chemical treatment, but the "heavier" mercaptans will remain virtually untouched. The thiophenes may be removed only with great difficulty and expense. Subsequent refining processes will serve to degrade some at least of the remaining sulfur compounds, leaving the whole problem still to be solved in purifying the products. Also, sulfur compounds will leave their mark on the refining equipment if it is not suitably protected.

Some idea of the widely varying amounts of total sulfur present in the crude oils found in West Texas may be had from investigations conducted by the U. S. Bureau of Mines. In the latest report available to the writer, analyses by the Bureau's technologists are given on 19 West Texas crudes. (1) A summary of these appears in Table 1. Table 2 gives a more detailed summary of the analytical results from 5 representative high-sulfur crudes taken from samples listed in Table 1.

Effect on Refining Equipment

The effect of sulfur on refining equipment cannot be defined precisely. Among the factors which may have a bearing on sulfur corrosion, either singly or collectively, are; type of crude, sulfur content and form in which present, presence or absence of inorganic salts and water, metal of which equipment is constructed, and conditions encountered during the refining operation itself, which may include temperature, pressure, cracking or forming, polymerizing, flow velocities, etc.

Because of the many different designs and arrangements of refineries now handling sour crude, it is not possible to present hard and fast rules for "newcomers" to follow. Certainly the "know how" is important and, save for a few guiding lights, it must be gained the hard way—by experience. Questions concerning specific problems should be directed at consulting engineers and process design experts, refiners state. They can best pass on whether a given refining unit may be revamped

Table 1—Characteristics of West Texas Crude Oils
(From U. S. Bureau of Mines Report of Investigations R. I. 3699, April, 1943)

Sample No.	County	Base of Crude	Properties of Crude Oil: Grav. A.P.I.	S %	Vis. at 100° F.	Carbon Res. %	Total Gasoline & Naphtha: %	Grav. A.P.I.	Vac.	%	Res'duum: Grav. A.P.I.	Carbon Res. %
1	Pecos	Par.	43.6	0.14	38	1.5	33.4	66.1	Pres.	20.8	17.9	7.2
2	Reeves	Inter.	27.7	1.82	94	2.5	10.8	46.7	Abs.	34.0	18.2	7.3
3	Pecos	Par. Inter.	38.6	0.27	43	1.9	27.0	60.5	Pres.	24.5	18.6	7.7
4	Ward	Inter.	34.4	1.06	45	2.2	28.8	58.9	Pres.	26.5	15.9	8.3
5	Cochran	Inter.	29.9	2.20	48	4.8	30.8	55.4	Pres.	26.5	7.2	18.1
6	Crane	Inter.	34.4	1.49	45	2.4	29.9	58.7	Pres.	24.9	14.7	9.7
7	Ector	Inter.	36.4	1.07	41	1.9	33.3	58.2	Pres.	24.4	16.5	7.7
8	Ector	Inter.	35.8	...	40	1.9	32.6	58.4	Pres.	24.1	15.6	7.9
9	Andrews	Inter.	43.2	0.48	38	1.0	36.0	61.5	Pres.	18.1	20.3	5.3
10	Ector	Inter.	36.0	1.15	41	2.1	34.1	57.7	Pres.	25.3	15.4	8.3
11	Howard	Inter.	24.0	2.76	98	8.3	23.3	55.9	Pres.	37.8	4.7	21.9
12	Crockett	Inter.	33.0	1.18	57	3.6	26.3	58.7	Pres.	32.1	15.3	11.1
13	Gaines	Inter.	35.6	1.76	39	2.5	34.4	58.9	Pres.	23.4	12.6	10.5
14	Ward	Par.	30.6	0.29	115	2.4	7.7	56.7	Pres.	46.6	22.6	5.2
15	Hockley	Inter.	32.3	1.93	45	3.5	32.0	55.7	Abs.	27.3	10.9	13.0
16	Howard	Inter.	29.9	1.68	48	4.7	29.0	55.2	Pres.	28.9	9.3	16.2
17	Pecos	Naph. Inter.	25.7	1.93	95	4.1	17.9	54.7	Abs.	36.2	12.7	11.3
18	Crockett	Inter.	40.0	0.15	39	0.7	33.6	59.2	Pres.	22.3	22.3	3.0
19	Crockett	Naph. Inter.	22.8	3.06	145	4.7	9.3	47.2	Pres.	28.8	10.1	16.4

Table 2—Summary of Approximate Product Yields from 5 Representative West Texas Crudes

(Sample numbers correspond with those in Table No. 1)

Sample No. 2, Reeves County, S % 1.82, Color, greenish-black

Product	% Yield	A.P.I. Grav.	Vis.
Light gasoline	...	...	...
Total gasoline and naphtha	10.8	46.7	...
Kerosene distillate	6.4	41.1	...
Gas oil	22.9	35.0	...
Nonviscous lubricating distillate	11.0	31.0-27.9	50-100
Medium lubricating distillate	8.8	27.9-25.9	100-200
Viscous lubricating distillate	5.3	25.9-24.9	Above 200
Residuum	34.0	18.2	...
Distillation loss	0.8	...	...

Sample No. 5, Cochran County, S % 2.20, Color, brownish-black

Product	% Yield	A.P.I. Grav.	Vis.
Light gasoline	9.7	68.9	...
Total gasoline and naphtha	30.8	55.4	...
Kerosene distillate	4.2	42.6	...
Gas oil	19.0	33.8	...
Nonviscous lubricating distillate	9.2	27.7-23.1	50-100
Medium lubricating distillate	7.4	23.1-20.8	100-200
Viscous lubricating distillate	2.1	20.8-20.2	Above 200
Residuum	26.5	7.2	...
Distillation loss	0.8	...	...

Sample No. 10, Ector County, S % 1.15, Color, greenish-black

Product	% Yield	A.P.I. Grav.	Vis.
Light gasoline	10.6	72.1	...
Total gasoline and naphtha	34.1	57.7	...
Kerosene distillate	5.0	43.0	...
Gas oil	19.7	35.8	...
Nonviscous lubricating distillate	9.6	30.6-26.6	50-100
Medium lubricating distillate	6.1	26.6-24.7	100-200
Viscous lubricating distillate	...	...	Above 200
Residuum	25.3	15.4	...
Distillation loss	0.2	...	...

Sample No. 11, Howard County, S % 2.76, Color, brownish-black

Product	% Yield	A.P.I. Grav.	Vis.
Light gasoline	7.4	71.2	...
Total gasoline and naphtha	23.3	55.9	...
Kerosene distillate	3.9	41.9	...
Gas oil	17.9	32.7	...
Nonviscous lubricating distillate	8.8	25.9-22.1	50-100
Medium lubricating distillate	5.9	22.1-20.3	100-200
Viscous lubricating distillate	1.7	20.3-19.8	Above 200
Residuum	37.8	4.7	...
Distillation loss	0.7	...	...

Sample No. 19, Crockett County, S % 3.06, Color, greenish-black

Product	% Yield	A.P.I. Grav.	Vis.
Light gasoline	...	...	...
Total gasoline and naphtha	9.3	47.2	...
Kerosene distillate	...	...	...
Gas oil	26.5	32.7	...
Nonviscous lubricating distillate	12.7	27.9-23.5	50-100
Medium lubricating distillate	12.7	23.5-21.5	100-200
Viscous lubricating distillate	9.7	21.5-20.2	Above 200
Residuum	28.8	10.1	...
Distillation loss	0.3	...	...

to handle sour crude, and tell just what changes should be made in operating techniques. However, a few suggestive methods of handling which are used in some plants are discussed in this article, without prejudice as to respective merit. Also, various treating methods are presented with the same thought.

Crude Not Desulfurized

In general, most refiners make no attempt to desulfurize crude prior to processing. Some, however, do prestabilize, which removes a part of the hydrogen sulfide but not the heavier sulfur compounds. In one case, in which the refinery is equipped with chromium steel tubes (4-6% chromium, 0.5% molybdenum), the refiner removes water by electrical desalting involving addition of water and electrical dehydration, after which the treated crude is topped into a number of fractions by stripping. These lighter fractions then are desulfurized to meet specifications for the finished products. The topped crude is thermally cracked in conventional fashion.

Some refiners say reforming will reduce sulfur content of straight-run gasolines approximately 40-60%, but report this practice is much less effective on cracked gasolines. However, others are known to "re-crack" or reform cracked fractions.

Another refiner removes all the water possible from the crude prior to processing. This is accomplished through heating the oil (with exhaust steam or in heat exchangers) in a "gun-barrel" arrangement, then permitting water and crude to separate. Emulsion-breakers may be used if desired. No further treatment is accorded prior to processing.

Another refiner states there is little danger of sulfur corrosion of carbon-steel equipment so long as temperatures are kept below 700° F. Above this temperature an alloy steel is necessary, such as 4-6% chromium. At still higher temperatures—900° F. is lower limit according to some—a higher chromium content is required. Introduction of ammonia into the crude stream will protect against hydrochloric acid corrosion (from decomposition of magnesium chloride), according to this refiner, but affords less protection against sulfur corrosion; "dry" distillation and "dry" general processing is necessary, he states. Another operator consulted on this point reported trouble in heat exchange and other equipment if sufficient water vapor is not present to preclude plugging of equipment from solid ammonium chloride.

Some refiners use lime, in any one of several patented processes available and in common use, but others state that, while this may reduce corrosion, its presence in the fuel oil (or coke) is objectionable. A few lick the problem by blending sour and sweet crudes to a sufficient extent that the over-all sulfur content is reduced sufficiently that equipment is not attacked. There are varying opinions as to the efficacy of this manner of handling the oil.

A representative West Texas refiner, operating cracking, skimming and reforming units, runs 100% sour West Texas oil. Crude topping (skimming) units are unprotected, insofar as alloy steel tubes are concerned. Tubes and vapor lines are low carbon steel, with no serious sulfur corrosion losses reported. Straight-run gasoline from this unit undergoes either reforming or is distilled to blending specifications. Partial sweetening of straight-run is accomplished through high-temperature vapor-phase clay desulfurization (similar to Perco catalytic desulfurization described later), using certain West Texas clays or fullers earth. With certain straight-run gasolines, sulfur content is reduced from 0.2 to below 0.05%, total, using West Texas clay, in making a blend for 91-octane aviation gasoline meeting Army requirements. The same process is used in making Ethyl gasoline. The clay bed temperature is held at 750° F., a comparatively recent innovation in this plant since temperatures for treatment of gasoline to be sold as Ethyl formerly were held at 650° F. Procedure is a modification of the so-called "Gray Process."

In this West Texas refinery, standard tubes of 4-6% chromium, 0.5% molybdenum, are used in cracking stills and units operated as reformers. The same alloy is used in overhead vapor and transfer lines, where corrosion losses had been encountered in the past. Lime, ranging from 0.6 to 1.0 lb. per bbl. charge, is used to combat sulfur corrosion, the amount depending on the charge, which varies from gas oil through heavy oil to all crude. In the crude stills proper (topping), lime charge varies between 0.1 to 0.2 lb. per bbl. of charge.

In fractionator towers and reaction chambers, a variety of protection is used, and search continues for a still more satisfactory protective coating. In some areas of reaction chambers or soakers there is no protection, the

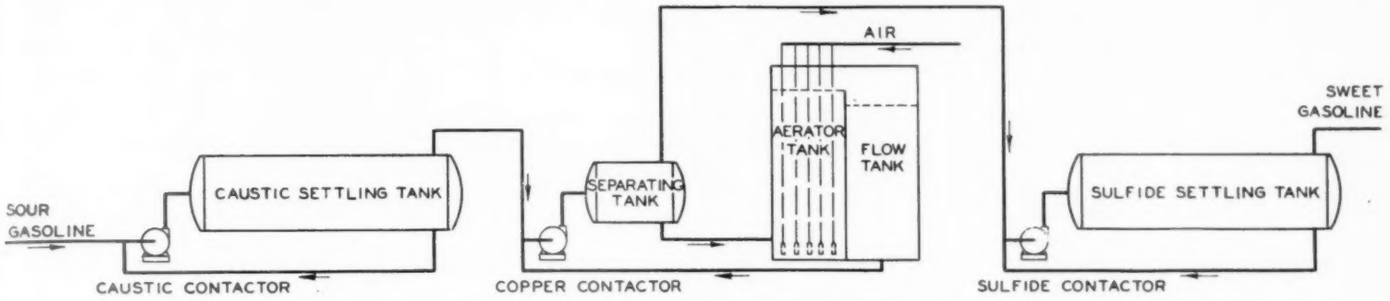


Fig. 1—Solution process. Perco Copper Sweetening

thin, hard coating of coke deposited serving to protect the base metal. Nozzles, however, are lined with chromium. In some fractionating towers, an inner lining of transite brick has stood up with fair satisfaction, the main trouble being formation of cracks in the masonry which permitted corrosive material to attack the base metal.

Gunite or gannister-type coatings have been used in other towers, again with moderate success, but difficulties due to spalling and cracking off have been encountered. Other refiners are reported to have used gunite linings with good results, hence the difficulty in this plant may have been due to improper application and curing time, although care was taken to follow the manufacturer's recommendations and the contractor was experienced in the work.

Trays and risers of 11-13% chromium alloy have been tried in partial replacement of original cast iron in fractionator towers with improved results.

This particular refiner has had no experience to date with metallized coatings of 4-6% chromium alloy in any of his equipment, although reports he has had from other refiners are said to be favorable. One of this refiner's cracking stills is a modified Dubbs unit and the other a standard Dubbs. The highest temperature reached when reforming operations are in progress is 1040-1050° F. During conventional thermal cracking operations, heavy oil coil outlet temperature is 910-920° F., light oil temperature 960-970° F., and sometimes as low as 950° F. The pressure on the reaction chamber is 300 lbs. per sq. in.; flash chamber is at 80-90 lbs. per sq. in. pressure, with temperature a maximum of 815° F.

This refiner's standard procedure has been to use Admiralty metal on all vapor-to-charge exchangers and gasoline condensers to cut down corrosion. No ammonia is used, although in the topping stills, which have carbon steel gasoline run-down lines, some experimentation has been carried on with chrome glucosates. Inconclusive results are reported to date. This refiner believes in the light of the experience of others, that the use of ammonia in crude stills might pay out if carried on under proper technical supervision; not because of sulfur corrosion, but to reduce the effect of hydrochloric acid corrosion. He stated it is frequently difficult to distinguish between sulfur and hydrochloric acid corrosion. This refiner does not desalt his crude but some others in the area use a variety of desalting methods, both electrical and physical, with reported good results.

Effect of Sulfur in Engines

In the past there has been considerable disagreement among federal and state government authorities as well as oil company technologists, as to the effect of sulfur-bearing fuels on internal combustion engines. For a long time 0.1% total sulfur was considered the proper maximum for gasoline, but this limit was imposed in the days when few sour fields had been discovered—hence was easily met. Apparently, little technical data ever were available to justify such a low limit, and it is now thought that with modern advances in engine design through crankcase ventilation, higher lubricant temperatures, and other improvements, a low sulfur content is a minor consideration.

Indicative too, of the disagreement of opinions on permissible sulfur content are the several specifications of the state governments. According to the Western Petroleum Refiners Assn., 12 states have no gasoline inspection laws whatever, 11 have no maximum sulfur specifications, 5 have a maximum of 0.1% sulfur content, 7 specify fuels must meet federal specifications (which have remained at 0.1% maximum for many years), and 13 permit from 0.15 to 0.25% maximum sulfur in gasolines.

An interesting point has been brought out by Round (2) in a discussion of Army fuels and lubricants: The Army 72-octane grade motor fuel (U.S.A. Specification No. 2-114) limits sulfur to 0.25% maximum for temperatures from 50° F. to extreme heat, 0.20% for temperatures ranging from 25° to 70° F., and 0.15% for temperatures lower than 45° F. However, for the all-purpose 80-octane grade (U.S.A. Specification No. 2-103B) which has been proposed for official adoption, 0.25% maximum sulfur is permitted for all climates. Round states this last change "makes available large supplies of fuel which have never been shown to be detrimental."

Effect of Sulfur on Gasoline

It has been definitely shown that certain forms of sulfur have a detrimental effect on the lead susceptibility of a gasoline and that some of these compounds are responsible for a highly objectionable odor. These compounds include hydrogen sulfide and the mercaptans, but alkyl sulfides, disulfides, and polysulfides have been shown to be the worst offenders in depressing lead susceptibility in finished gaso-

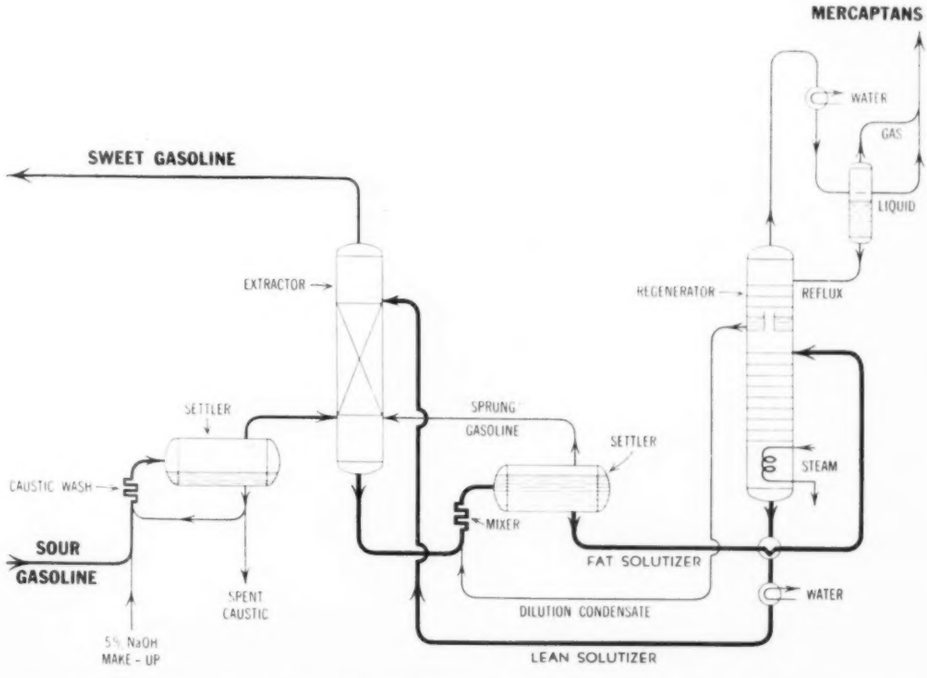


Fig. 3—Simplified flowsheet of Solutizer Process for extraction of soluble sulfur compounds

lines. A third group, the thiophenes, have been shown less materially to affect lead susceptibility and they do not have a foul odor or cause corrosion.

This is fortunate, since these heterocyclic compounds can be removed only with great difficulty and expense; the removal (by concentrated sulfuric acid) is reportedly accompanied by lowered octane rating through simultaneous removal of some of the unsaturated hydrocarbons having high anti-knock qualities.

Hydrogen sulfide, which is corrosive to equipment used for storage, transportation and use of the fuel, can be removed by simple chemical treatment at no great cost. This may be accomplished by a caustic wash, or a wash with lime solution, while some have suggested treatment with tri-potassium phosphate (3). Depropanizing the product by distillation also removes most of the hydrogen sulfide.

Removal of Mercaptans

Removal of the lighter mercaptans may be readily accomplished by treating with a caustic solution, or with the well-known "doctor" treatment these compounds may be converted to disulfides—in which form they are odorless but equally harmful (as the mercaptans) to anti-knock rating or lead susceptibility. However, some authorities (4) state that doctor treating also results in formation of alkyl polysulfides in addition to disulfides, with octane number loss proportional to the amounts of the polysulfides present. Doctor treating generally increases sulfur content of gasoline slightly. Another method of eliminating mercaptans is through a process patented by Phillips Petroleum Co. called Perco Copper Sweetening (5) which is used by some refiners. Here again this method does not change the total sulfur content of a product.

Copper Sweetening Described

Copper sweetening entails the reaction of a mercaptan-bearing gasoline, free of hydrogen sulfide, with an aqueous solution of cupric chloride at atmospheric temperature and whatever pressure may prove desirable. The reaction may be written in simplified form thus: $4RSH + 4CuCl_2 \rightarrow 2RSSR + 4CuCl + 4HCl$. The cuprous chloride formed, together with the hydrochloric acid, may be converted into cupric chloride (i.e. regenerated) by the addition of oxygen: $4CuCl + 4HCl + O_2 \rightarrow 4CuCl_2 + 2H_2O$. Thus, with the initial cost of the copper chloride amortized, the only chemical which must be provided regularly is oxygen—and this is secured in practice by blowing the spent treating solution with air. As a variation on the aqueous solution of cupric chloride, the so-called "solid" reagent may be employed. This "solid" reagent is made by impregnating an adsorbent such as fullers earth with the aqueous reagent. Some gasoline is treated by contacting with a fixed bed of the reagent. Regeneration of the spent copper salt is accomplished in place by dissolving a pre-determined amount of air in the gasoline prior to treating.

Careful tests indicate that the mercaptans are converted directly and completely to disulfides with no appreciable octane loss or reduction in tetraethyl lead (TEL) susceptibility. Moreover, process owners claim copper sweetened gasolines have higher octane ratings, improved sunlight stability, no potential corrosiveness and higher gum stability with smaller amounts of inhibitors than the same sour gasoline treated by the doctor method.

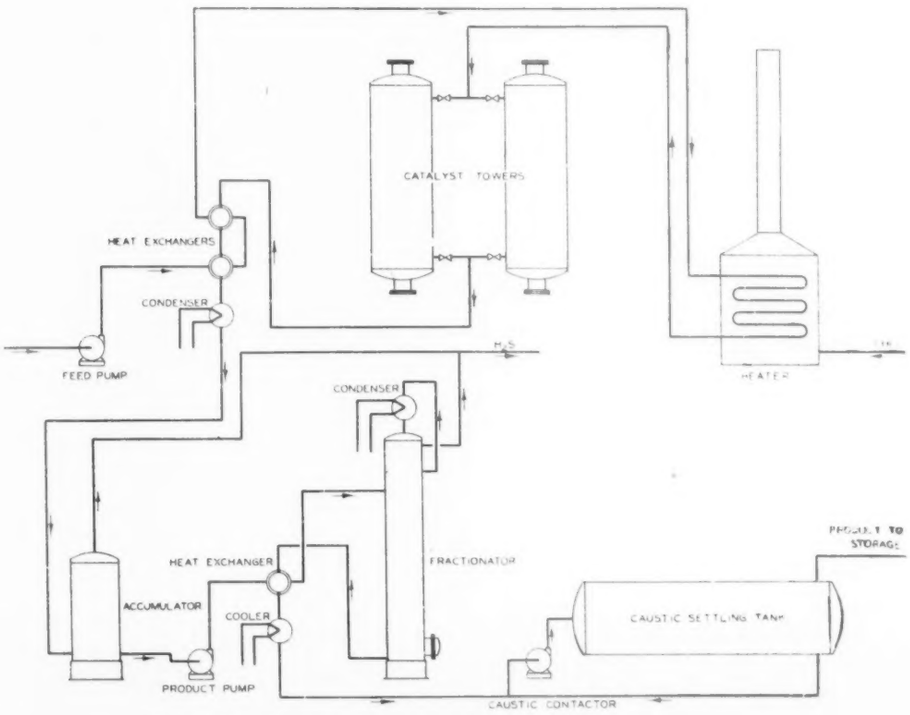


Fig. 2—Flowsheet for Perco Catalytic Desulfurization process

A flow-sheet of solution copper sweetening processes is shown in Fig. 1. Sour gasoline is contacted with a caustic solution containing alkaline polysulfides and then permitted to settle. This removes hydrogen sulfide and any free sulfur which may be present. From the caustic settler the product is contacted with the cupric chloride solution and then settled again. Sweet gasoline goes overhead from this settler to a sulfide contactor, while spent copper solution is charged to an aerator tank where it is blown with air for regeneration before recycling. Contacting the sweet gasoline with a sodium sulfide solution is used especially with cracked gasolines or blends to prevent any color instability due to the possible presence of minute amounts of copper compounds, such as the naphthenates, which act as oxidation catalysts and are evidenced by color instability.

In the so-called solid copper sweetening process especially developed for high vapor pressure gasolines, straight run gasolines and natural gasoline, the process is much the same, except that air is dissolved in the gasoline to regenerate the copper salt in place, and the sulfide step is eliminated because copper naphthenates, etc., are not present.

Costs utilizing the Perco method of copper sweetening are said to be exceedingly low, especially when compared to doctor sweetening. Moreover, savings in lead susceptibility, freedom from disposal of spent solutions and negligible product losses through treating are important factors to be considered. In the first place, it is necessary to replace the copper salts very infrequently, the only losses occurring being purely mechanical. The only chemical which must be supplied regularly is oxygen, readily available from the air for pumping cost alone. Equipment is relatively small, especially for the solid process, thus reducing investment. The process lends itself to continuous operation, and can be made practically automatic to the extent that little or no attention is required over long periods of time. Treating costs, exclusive of licensing royalties, are usually less than 2c per bbl. for the "solution" method, using very high sulfur gasoline as an example, and only 1 or 2c or less per 1000 gal. for the "solid" method with a gasoline having a much lower sulfur content.

Reduction of Total Sulfur

Among the more important commercial processes for the removal of sulfur (it should be noted that doctor and copper sweetening *do not* remove sulfur but merely convert it to a less-objectionable form) are 3: catalytic desulfurization, extraction by caustic methanol, and extraction by means of other "solutizers" such as Shell Oil Co.'s process by the same name. To these may be added a fourth, known as the "cold acid" process, which is based on the selective solvent effect which cold sulfuric acid has on sulfur compounds. This latter method has the objection of removing some of the unsaturated compounds high in anti-knock rating, simultaneously with desulfurizing proper, but not to the extent incurred where acid treating is done at normal temperatures.

One method of catalytic desulfurization,

known as "Perco Catalytic Desulfurization" has been patented by Phillips Petroleum Co. (6, 7). In this process (Fig. 2), raw feed to be desulfurized is pumped through heat exchangers to a tubular heater where complete vaporization and superheating to 750° F. is obtained. The superheated vapors then pass in downward flow through one of the 2 catalyst chambers where up to 95% of the organic sulfur compounds are decomposed to hydrogen sulfide and the corresponding hydrocarbon by the action of a catalyst prepared from natural bauxite. Catalyst costs approximately $44 per ton in place. In heat exchange with incoming sour charge, the treated vapors are cooled to approximately 165° F., passing thence to a condenser where they are further cooled to approximately 85° F. and collected in an accumulator drum. Depending on local economics, removal of hydrogen sulfide from the treated product may be effected by straight caustic washing or a combination of water and caustic washing. Or, preferably, the product may be stabilized, followed by caustic washing, and then run to storage. Generally stabilization is utilized for most economical results. The stabilizer overhead usually goes direct to the fuel gas system.

Depending on the type of product desulfurized, the catalyst may or may not be regenerated. Regeneration may be effected either by controlled oxidation of the catalyst in place or in any conventional type clay burner. Where straight-run gasolines or natural gasolines are de-sulfurized, catalyst life (as determined by appearance of a sour doctor test) of the order of 2500 to 5000 bbl. throughput per ton of catalyst makes unnecessary the expense of installing and operating regeneration equipment. However, where stocks giving shorter catalyst life are charged, such as cracked and polymer gasolines, regeneration equipment is installed. Catalyst masses have been regenerated from 15 to 20 times without apparent loss of activity or falling off in catalyst life cycle. Throughput rates for catalytic desulfurization range from 300-400 bbls. gasoline per day per ton of catalyst; costs range from 5 to 8c per bbl. of gasoline, exclusive of royalty costs.

Tables 3 and 4 show typical results after catalytic desulfurization of 2 straight-run gasolines, one from Michigan and the other from New Mexico crudes. In Table 3, Michigan crude, the straight run gasoline had a total sulfur content of 0.036% before desulfurizing, a clear octane rating of 52.2 and a 1 cc. TEL point of 62.5. After desulfurizing, an improvement of 1.4 clear octane numbers will be noted, while, of still more importance, the 1 cc. TEL point was increased to 66.3, a net increase of 3.8 octane numbers. Total sulfur was reduced to 0.002% and all mercaptan sulfur removed. It should be noted also that the other characteristics of the desulfurized product agree with the sour charge, the differences between treated and untreated gasoline being largely within limits of experimental error. Similar evidence is apparent from study of the data in Table 4, on a New Mexico straight-run gasoline. The column headed "laboratory cadmium washed" is included as a check on the plant's removal of very few sulfur compounds other than hydrogen sulfide by caustic washing.

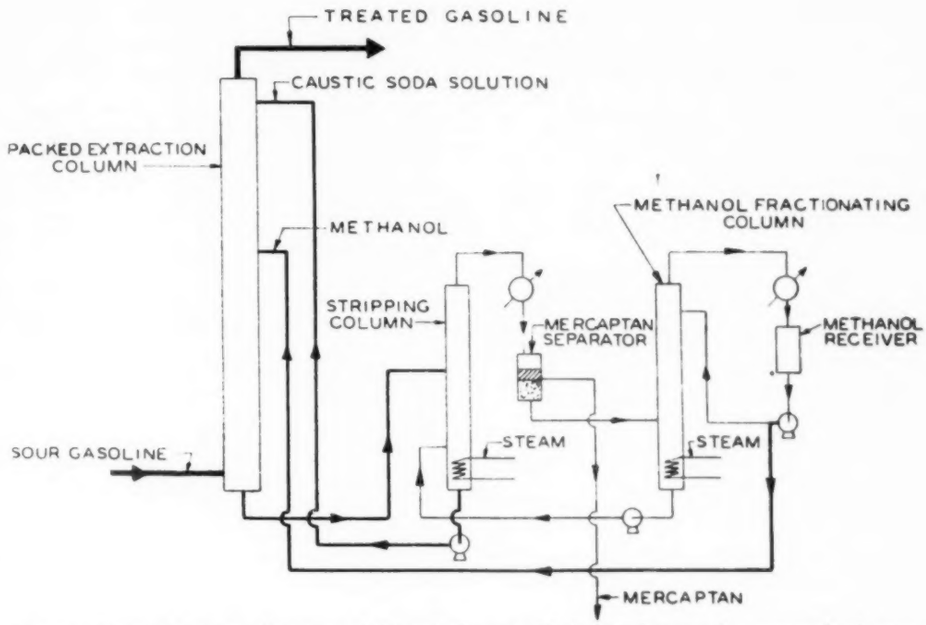


Fig. 4—Simplified flow diagram of Unisol Caustic Methanol Process for removal of mercaptans

Table 5 shows data obtained on catalytic desulfurization of a blend of straight-run and cracked gasolines. Here again, the same marked reduction in total and mercaptan sulfur content will be noted in the treated sample, as well as marked increase in lead susceptibility. Also, the other characteristics of the desulfurized gasoline are unchanged from the sour charge, within limits of experimental error. Table 6 shows typical results of catalytically desulfurizing 11 West Texas straight-run gasolines.

Shell's 'Solutizer' Process

Another method of reducing total sulfur is through the extraction of soluble sulfur com-

Table 3—Results from Catalytic Desulfurization of Straight-Run Gasoline from Michigan Crude

	Before Desulfurizing	After Desulfurizing
ASTM Octane No.		
0 cc. TEL per gal.	52.2	53.6
1 cc. TEL per gal.	62.5	66.3
2 cc. TEL per gal.	68.5	74.0
3 cc. TEL per gal.	72.0	78.1
Total Sulfur, per cent	0.036	0.002
Mercaptan Sulfur, per cent	0.022	Sweet
Corrosion, 3 Hr. at 122°F.	Neg.	Neg.
Reid Vapor Pressure, lb./sq. in.	11.0	10.8
Gravity °A.P.I.	65.7	65.7
Distillation, °F.		
First Drop	88	88
5% evap.	100	102
10% evap.	126	128
20% evap.	158	158
30% evap.	184	184
40% evap.	206	206
50% evap.	227	227
60% evap.	246	245
70% evap.	265	263
80% evap.	285	286
90% evap.	313	316
95% evap.	334	338
End Point	380	380
Recovery	96.2	96.0
Residue	0.4	0.4
Loss	3.4	3.6

Table 8—Results of Caustic Methanol Sweetening of West Texas Cracked and Straight-Run Gasolines, and Other Gasolines

Gasoline Treated	Mercaptan Sulfur, % Before	Mercaptan Sulfur, % After	Total Sulfur, % Before	Total Sulfur, % After	Octane Numbers Before Treating: 0	1 cc tetraethyl lead	2 cc tetraethyl lead	3 cc tetraethyl lead	Octane Numbers After Treating: 0	1 cc tetraethyl lead	2 cc tetraethyl lead	3 cc tetraethyl lead
Laboratory												
Panhandle Tex.	0.061	0.0002	0.15	0.10	63.2	68.3		72.2	63.2	69.2		73.4
W. Tex. Cracked	0.18	0.0002	0.77	0.50	66.0	68.8		71.4	66.5	70.6		74.2
Michigan	0.048	0.0003	0.13	0.10	66.5	72.0		75.8	66.5	73.6		78.3
Illinois	0.036	0.0002	0.09	0.06	67.1	73.0		76.5	67.1	73.8		77.8
Pilot Plant												
W. Tex. Cracked Polymer Blend	0.0615	0.0007	0.190	0.128	74.0	78.0	80.5	81.5	74.0	80.0	82.2	83.8
Low Sulfur Cracked	0.0226	0.0003	0.092	0.071	71.7	77.3	79.1	80.5	72.0	78.0	80.0	81.3
Straight Run Mixture	0.009	0.0002	0.057	0.049	62.5	70.1	74.7	78.2	64.2	72.1	77.8	80.5
W. Texas Straight Run	0.061	0.0003	0.125	0.055	69.8	73.0	76.5	79.0	71.5	78.9	81.7	83.0
High Sulfur Cracked*	0.050	0.0004	0.248	0.182	68.6	72.8	74.9	76.0	68.8	73.6	75.9	77.0

*Approximately 50% of mercaptans in this stock previously removed by caustic washing.

Table 4—Results from Catalytic Desulfurization of Straight-Run Gasoline from New Mexico Crude

ASTM Octane No.	Undesulfurized Laboratory Cadmium Washed	Plant Caustic Washed	Desulf.
+0 cc. TEL	58.4	59.2	61.2
+1 cc. TEL	66.9	68.4	72.9
+2 cc. TEL	71.2	72.6	78.6
+3 cc. TEL	74.6	76.0	81.0
ASTM Dist., °F.			
First Drop	97	97	100
5% evap.	123	127	130
10% evap.	154	156	155
20% evap.	188	186	186
30% evap.	210	206	208
40% evap.	227	225	225
50% evap.	243	242	242
60% evap.	261	260	258
70% evap.	281	278	277
80% evap.	303	300	301
90% evap.	332	328	329
95% evap.	357	353	356
End Point	418	420	420
Recovery, %	97.1	97.1	97.6
Residue, %	0.7	0.7	0.6
Loss, %	2.2	2.2	1.8
R.V.P., psi	8.00	8.10	7.85
Gravity, °A.P.I.	57.8	58.1	58.0
Mercaptan Sulfur, %	0.031	0.025	0.001
Total Sulfur, %	0.069	0.058	0.005

Table 5—Data on Catalytic Desulfurization of Blend of Straight-Run and Cracked Gasolines

	Before Desulf.	After Desulf. 0-24 Hrs.	After Desulf. 24-48 Hrs.
ASTM Octane No.			
0 cc. TEL per gal.	65.5	68.7	67.9
1 cc. TEL per gal.	69.9	74.2	73.0
2 cc. TEL per gal.	71.9	77.7	75.9
3 cc. TEL per gal.	73.5	80.0	78.3
Research Octane No.			
0 cc. TEL per gal.	68.6	73.1	72.1
1 cc. TEL per gal.	74.2	80.2	78.6
Total Sulfur, %	0.320	0.115	0.153
Mercaptan Sulfur, %	0.106	0.0025	0.020
Barrels per ton throughput on catalyst	0	215	435
Reid Vapor Pressure	11.90	12.7	12.2
Gravity, °A.P.I.	61.6	61.7	61.6
ASTM Dist. °F.			
First Drop	88	86	87
5% evap.	94	92	98
10% evap.	123	122	124
20% evap.	159	157	159
30% evap.	192	187	190
40% evap.	220	216	218
50% evap.	247	244	245
60% evap.	273	270	272
70% evap.	298	295	297
80% evap.	324	324	323
90% evap.	354	355	355
95% evap.	375	377	378
End Point	411	434	410
Recovery, %	95.1	94.9	95.8
Residue, %	0.6	1.0	0.6
Loss, %	4.3	4.1	3.6

pounds by caustic solutions, usually sodium hydroxide solutions. A number of investigators have shown that mercaptans, the most serious offender among the sulfur compounds ordinarily present in gasoline, are soluble in such caustic solutions. Unfortunately, however, all the mercaptans are not soluble to the same extent, the higher molecular weight compounds being relatively insoluble because of decreased solubility in the water making up the solution and the "salting out" effect of the caustic itself. Shell Development Co. has been one of the pioneers in searching for a material to be added to caustic solutions which would increase the solubility of relatively high molecular weight mercaptans (8). The "solutizer" which was found most effective, a potassium or sodium salt of isobutyric acid, was developed into the patented process known as the Solutizer Process.

The extracting solution used is 6 normal caustic potash with 3 normal potassium isobutyrate as solutizer. Fig. 3 is a simplified flow sheet of the process. Sour gasoline, generally containing mercaptans, hydrogen sulfide, other forms of combined sulfur, elemental sulfur and organic acids, is first washed in dilute caustic solution to preclude loss of alkalinity in the extracting solution and to avoid contaminating it with these impurities. The gasoline then is charged to a settler where the wash caustic is removed for recycle.

From the settler the raw gasoline is charged to a vertical extraction tower where it enters below a bed of raschig rings and rises slowly to the top. It emerges from the extractor as not only doctor sweet but of lower sulfur content than it originally possessed. The extracting solution enters at the top of the contact bed, flowing downward by reason of its greater specific gravity (1.3 to 1.4). Intermingling of solutizer solution and raw gasoline on the large contact surface presented by the rings permits extraction of the mercaptans.

Fat solutizer disengages from the gasoline at the bottom of the tower, going thence to a settler after being diluted with a small amount of water to "spring" any dissolved gasoline. From the settler, fat solutizer is charged to a regenerator where it is stripped of mercaptans with steam and re-concentrated to original strength. Steam and mercaptans from the regenerator overheat are condensed, gaseous mercaptans going to a stack to be burned and condensed liquids flowing downward to an accumulator. In the accumulator, the mercaptans float on the water in an upper layer, whence they may be pumped away for burning or recovery, as desired. The water layer is pumped back to the regenerator as reflux and also, as dilution condensate, is used to dilute the solutizer solution to "spring" dissolved gasoline.

Table 7 shows the effect of treating various types of sour gasoline by the solutizer process. Savings in lead costs through solutizing range from 1 to 13.6c per bbl. when leading up to 72 octane; for 76 octane savings range from 1 to 16.8c per bbl. Operating costs for a 12,000 to 15,000 b/d capacity plant, including steam, water, electricity for power and lights, labor and supervision, is estimated 1.25 to 1.50c per bbl. charge. Doctor treatment is estimated to cost 1c per bbl. in "sweetening" the same stock, and, in addition, there should be considered the losses in product degradation and by product dissolving in the solution used and lost during the regeneration of the solution.

Desulfurization by Caustic-Methanol

The caustic-methanol process, developed by Atlantic Refining Co. and licensed by Universal Oil Products Co., is based on the increased "holding power" of a caustic solution for mercaptans if the "salting out" effect of the caustic itself is prevented by use of methanol (methyl alcohol). While comparatively recent, it is in commercial use by some oil companies processing sour crudes.

The caustic-methanol or "Unisol" process has been described by Field (9). It is an extractive process, rather than a "conversion" process like doctor sweetening, as shown by the reduction to extremely low values of mercaptan content accompanied by simultaneous reduction in amount of total sulfur.

Typical data are shown in Table 8, compar-

Table 6—Typical Results of Catalytically Desulfurizing 11 West Texas Straight-Run Gasolines

Test	Gravity	R.V.P.	I.B.P.	10%	20%	50%	90%	E.P.	% S.	% RSH	A.S.T.M. Octane Number +0 cc.	+1 cc.	+2 cc.	+3 cc.
1	62.5	7.7	100	143	165	229	323	384	0.125	0.025	59.5	67.1	72.1	74.6
	(Desulfurized)								0.003	0.001	61.9	74.2	79.6	81.8
2	61.4	6.5	104	142	166	242	339	393	0.142	0.027	58.5	65.1	69.8	72.3
	(Desulfurized)								0.004	Sweet	60.9	72.3	78.2	81.1
3	54.8	2.6	144	198	214	259	343	394	0.140	0.066	56.6	63.6	67.5	70.0
	(Desulfurized)								0.008	Sweet	58.2	69.1	75.0	78.0
4	63.8	7.9	100	141	167	226	312	372	0.143	0.067	58.5	65.4	69.4	72.2
	(Desulfurized)								0.005	Sweet	60.8	72.8	78.5	81.4
5	64.2	8.8	92	140	167	218	297	369	0.118	0.038	58.7	67.1	72.2	75.6
	(Desulfurized)								0.010	Trace	61.7	73.9	79.4	82.3
6	58.4	5.9	110	157	183	240	334	398	0.309	0.148	53.8	59.2	63.0	65.9
	(Desulfurized)								0.017	Sweet	57.8	68.9	74.1	77.4
7	49.6	3.1	137	226	265	335	409	440	0.323	0.119	45.4	52.0	56.6	59.8
	(Desulfurized)								0.053	0.002	49.6	59.8	66.8	70.5
8	58.1		114	169	199	257	343	392	0.145	0.039	53.7	61.7	65.8	68.5
	(Desulfurized)								0.004	0.001	57.3	68.9	75.6	78.9
9	76.1	11.2	98	121	129	150	180	204	0.013	Sweet	76.0	85.0	88.7	91.2
	(Desulfurized)								0.002	Sweet	76.0	86.9	90.0	92.2
10	68.6	5.2	145	161	164	174	229	314	0.096	0.026	65.6	71.4	76.0	
	(Desulfurized)								0.008	0.001	65.6	77.7	82.3	
11	63.6	7.0	106	151	172	213	288	369	0.152	0.043	56.0	63.8	68.3	70.5
	(Desulfurized)								0.007	Sweet	59.9	70.4	77.2	80.8

Table 7—Effect of Solutizer Sweetening on Octane Number and Lead Susceptibility

Type of Gasoline	Properties of Untreated (Sour Gasolines) A.S.T.M. Dist. °F. IBP	FBP	API Grav.	Sulphur, % Weight Total	Mercaptan	% RSH Extr.	O.N. of Untreated Sour Gasoline, Motor Method TEL Addition Clear	1 cc.	2 cc.	3 cc.	Increase in O.N. Motor Method by Solutizing TEL Addition Clear	1 cc.	2 cc.	3 cc.
	91	293	79.3	0.466	0.172	37	65.0	70.5	73.5	75.5	2.0	3.2	4.2	3.9
	119	383	68.2	0.192	0.073	38	45.5	52.5	57.0	61.0	1.2	1.4	1.9	1.2
	104	370	64.9	0.033	0.006	18	53.0	63.5	69.5	73.0	0.6	0.0	0.0	0.3
Straight Run	113	351	62.6	0.112	0.052	46	63.5	71.5	75.0	77.5	0.4	2.5	3.0	3.3
	119	307	64.9	0.090	0.042	47	62.0	68.5	73.0	75.5	0.7	2.4	2.1	2.4
	118	433	59.4	0.115	0.042	37	43.5	51.5	57.0	60.5	0.3	2.5	3.6	4.3
	119	261	64.5	0.064	0.020	31	70.5	78.5	82.0	84.0	0.0	1.0	1.2	1.5
	115	398	57.9	0.217	0.082	38	63.0	68.5	70.5	72.0	0.4	1.7	2.0	2.8
	98	385	59.3	0.164	0.058	35	63.0	68.5	71.5	74.0	0.5	1.4	1.9	1.4
	92	245	77.9	0.292	0.184	63	75.5	78.0	.	81.5	0.8	2.6	.	2.4
	92	378	62.5	0.282	0.111	39	70.5	75.0	76.5	78.0	0.0	1.4	2.3	2.3
Cracked	109	389	57.9	0.128	0.037	29	65.0	71.0	73.0	75.0	0.5	0.9	1.0	1.3
	112	402	59.3	0.067	0.019	28	66.0	72.0	75.5	77.5	0.4	1.2	1.6	1.5
	98	435	55.9	0.303	0.090	30	70.0	72.5	75.5	76.5	0.5	1.0	1.3	2.5
	107	406	57.4	0.084	0.021	25	59.5	66.5	70.0	73.0	0.0	1.0	2.0	1.5
	95	398	60.1	0.305	0.117	38	67.5	71.5	.	75.5	0.8	2.0	.	2.7
	99	410	59.8	0.135	0.022	16	70.0	75.0	77.0	79.0	0.0	1.3	1.2	1.1
Blend of	105	377	60.9	0.090	0.022	24	67.0	73.5	77.0	79.0	0.9	1.0	1.1	0.6
Cracked &	103	385	59.6	0.186	0.056	30	67.0	73.0	75.5	77.5	0.0	1.4	1.9	2.0
Straight Run	111	388	60.7	0.093	0.016	17	58.0	65.5	70.0	72.5	0.2	0.7	0.9	0.7
Catalytic	79	414	75.8	0.470	0.193	41	70.0	75.0	77.0	78.5	0.4	1.4	1.7	2.0
Polymer	84	414	71.1	0.138	0.045	33	82.5	84.0	85.0	85.5	0.3	0.3	0.3	0.7
Reformed	116	396	52.7	0.130	0.059	45	69.0	75.0	78.0	79.0	0.4	0.9	1.1	1.6

ing laboratory and pilot plant sweetening of Panhandle, Texas, and West Texas cracked gasoline, as well as gasoline from other crudes. It will be noted that mercaptan sulfur is reduced to a quite low value while the reduction in total sulfur closely follows the reduction in mercaptan sulfur.

A simplified flow diagram appears in Fig. 4, with the process described by Field as follows:

"A hydrogen sulfide free gasoline is charged to the base of a tall countercurrent extraction column, packed with raschig rings. Methanol is introduced in the middle of the column and a concentrated aqueous solution of caustic soda is fed in near the top. The column is operated in the conventional manner, the gasoline passing upward and disengaging cleanly at the top. The caustic-methanol solution is drawn from the base of the extraction column and passed to a stripping column.

"From the stripper, which is fitted with an internal reboiler, methanol and water pass overhead to collect in a separator in two layers, the upper one mercaptan and the lower water-alcohol, the ratio of water to alcohol being regulated to keep it at the point of minimum solubility of mercaptan. In the stripping column, the caustic is regenerated and thence returned to the extraction column. The methanol-water passes from the separator to a small fractionating column, while the water from the base of the fractionating column returns to the stripping column.

"A noteworthy feature of the process is the great holding power for mercaptans of the solution of caustic soda containing methanol. Because of this, a low circulation rate of methanol and caustic is sufficient for effective mercaptan extraction. The combined methanol and caustic solution used usually do not exceed 3% of the volume of the gasoline. This low circulation makes it possible to regenerate the caustic with small sized, inexpensive equipment, using only a small amount of steam.

"The low operating costs are due to the fact that there is almost no loss of chemicals. Alcohol losses are generally 0.004% or less of the volume of the gasoline. Total operating costs on an average gasoline, including utilities, chemicals, labor, maintenance and insurance will be approximately 1 to 1.5c per bbl.

"The caustic-methanol process can readily handle gasolines of high phenol (tar acid) content. In the regeneration step, the methanol is distilled away from the caustic layer, leaving phenols and any other contaminants which may have come from the gasoline in the caustic solution. Portions of this solution can be discarded without losing any alcohol and without great cost, as caustic soda is a comparatively cheap reagent."

Preliminary caustic scrubbing, except for hydrogen sulfide removal, is said to be unnecessary with caustic methanol treating. Inhibitor response of caustic-methanol gasoline is described as excellent.

Literature Cited

1. Lane, E. C., U. S. Bureau of Mines Report of Investigations RI3699, April, 1943.
2. Round, G. A., NPN Technical Supplement, p. R-291-300, July 7, 1943.
3. LaCroix, H. N., "Hydrogen Sulfide Removal from Hydrocarbon Liquids and Gases," Western Petroleum Refiners Assn. Meeting, Shreveport, La., March 14, 1941.
4. Shulze, W. A., and Buell, A. E., National Petroleum News, p. 56 59, June 9, 1937.
5. Ibid., p. 24C-24H, Oct. 23, 1935.
6. Conn, M. W., "Application of Catalytic Desulfurization Process." Western Petroleum Refiners Assn. Meeting, Wichita, Kan., Oct. 4, 1940.
7. Pew, J. E., and Buell, A. E., NPN Refining Technology Edition, p. R-354-58, Oct. 2, 1940.
8. LaCroix, N. H., "Improving Lead Susceptibility of Gasoline by Refining with the Shell Solutizer Process", given before American Society of Mechanical Engineers, Metropolitan Division Petroleum Section, Jan. 16, 1941.
9. Field, H. W., National Petroleum News, Refining Technology Edition, p. R-316-18, Oct. 1, 1941.

Write for Your Answer to the Sludge Problem!

Picture shows simple method of picking up buckets loaded with sludge for hauling to dump pond.

Brooks LOAD LUGGER

You can use up to 5 or 10 dump buckets with each LOAD LUGGER unit. It fits any truck.

Some of the big oil companies have found the answer to their sludge-handling problems by using the LOAD LUGGER with detachable dump buckets for hauling tank sludge to the waste pond. It makes a hard job easy . . saves time and manpower . . conserves trucks and cuts costs. Handy equipment around refineries, marine terminals and storage yards for many material handling jobs.

2008 Davenport Road Knoxville, Tennessee

Distributors in all Principal Cities

Brooks EQUIPMENT AND MFG. CO.

FLUID CATALYTIC CRACKING UNIT
CONSTRUCTED BY FOSTER WHEELER
NOW!
FOSTER WHEELER
OFFERS THE
New Simplified Design
56% LESS STEEL
... SAME HIGH YIELDS
FW
FOSTER

Largest in the Country
. . . Accepted in 12 Days
This 33-ft. Vacuum Fractionating Unit completed all acceptance tests 12 days after starting up.
FOSTER WHEELER CORPORATION • 165 BROADWAY, NEW YORK, N.Y.
WHEELER
FW

Shale Oil, Other Substitutes And the Petroleum Shortage*

Economic considerations will play an important role when it comes to providing any substitute source of gasoline and other products, to supplement our supplies in the event of a shortage of petroleum in this country. Among such factors, particularly in a wartime economy, are the relative volumes of steel necessary to process such substitutes as coal or shale, if large scale production is required. Improved technology may make possible greater recovery of oil from shale than was estimated on the basis of experimental work conducted several years ago, and at prices possibly competitive with petroleum. Estimated costs are given for recovery of gasoline from various proposed substitutes.

The author is one of the authors of the important series of articles, "ABC of Chemical Derivatives from Petroleum", which was published in NPN's Technical Section during the past several months.

By B. H. Weil**

IN THE past few years, new discoveries of oil have failed to keep pace with consumption, which has risen steadily. Substantial depletion of petroleum supplies in any case cannot occur in less than 30 to 40 years, but it does appear highly probable that within a few years it may become desirable to supplement U. S. petroleum production in some manner.

Several methods of approach to this important problem have been proposed, all of which seem only partial answers. For this very reason, it is probable that no one of them will be used to the exclusion of others. Petroleum conservation, of course, is the first approach, since elimination of wasteful methods of production, refining, and use obviously will prolong the life of petroleum resources.

The importation of increasing amounts of petroleum from South America, as well as from other sources, is another method of solution, and one which seems likely to be adopted following the war, when oil tanker routes are no longer blocked by enemy submarines. This latter method has the advantage of favorable economics, since costs largely will be comparable to present American production prices if duties are removed (as should be done), but it has the disadvantage of making the nation dependent upon outside sources for what might be considered one of the most vital raw materials for war, should war come again.

Substitutes the Vogue Abroad

Alternate solutions to the above-mentioned ones concern production and use of petroleum substitutes of various types. Such widely-differing methods as the hydrogenation of coal and the use of charcoal-burning trailers (as is being done in London) have been proposed. Many of these are ready in use abroad, where the desire for national self-sufficiency has caused such nations as Germany and England to erect huge plants almost without regard to economics.

Almost all these substitute methods are practical within certain limitations, but few seem to have economics which can enable them to compete with petroleum or, in the case of gradually-increasing petroleum shortage, to augment supplies without greatly increasing costs.

Those methods which seem to deserve the most attention are: (1) production of shale oils from oil shales; (2) the hydrogenation of carbon monoxide (Fischer-Tropsch synthesis); (3) the hydrogenation of coal; and (4) the blending of hydrocarbon fuels with alcohol made from agricultural products.

In the U. S., research on substitute methods has been confined to a few far-sighted companies and such agencies as the Bureau of Mines, which is conducting experimentation upon coal hydrogenation and the Fischer-Tropsch process and, prior to 1930, conducted experiments on obtaining oils from oil shales. Further research is being advocated by Petroleum Administrator Ickes and legislation to effect this is impending.

Steel Requirements Major Factor

Thorough discussion of all these methods would be beyond the scope of a short speech. As regards the latter three methods, it must suffice to say that the Fischer-Tropsch hydrogenation of carbon monoxide would seem to have advantages over the hydrogenation of coal or the use of fuel alcohol as regards economics, especially if reactants were produced from natural gas. As regards wartime economics, also, the Fischer-Tropsch process requires less steel per barrel of motor gasoline per day for the erection of plants, but even here relatively large quantities of steel would be required, undoubtedly more than the wartime economy could support if large-scale production were desired.

Economics as regards the use of even 10% alcohol blends probably will remain unfavorable, technical considerations aside, but such a process may eventually be adopted either through political means or a desire to extend petroleum supplies without regard to cost. Steel requirements for wartime plant construction would be prohibitive.

As regards the hydrogenation of coal, coal supplies certainly are adequate to support such a process for hundreds of years, but American economy, left to itself, probably will not make use of this process until prices are forced much higher. An interesting comparison of coal and oil reserves has recently been made, incidentally.[1] It was stated that if present U. S. petroleum supplies were to be spread over the state of Ohio (41,000 square miles) they would cover it to a depth of only ¾ in., while U. S. coal deposits would bury Ohio in a layer 76 ft. deep.

Some Data on Costs

Accurate costs per gallon of gasoline by all these methods are hard to estimate, but approximate figures would be: (1) Fischer-Tropsch gasoline, from coal—18c per gal., from natural gas—9 to 12c per gal.; (2) coal hydrogenation gasoline—16c per gal. (with a far-distant potentiality of 12c per gal.); (3) 10% alcohol-blend gasoline—10c per gal. The latter estimate involves alcohol at over 40c per gal., a highly uneconomic figure; in addition, only 10% of this fuel would be a substitute, and

[1]Monsanto Magazine 22, No. 3, 24 (1943).

Many liquid hydrocarbons besides gasoline, fuel oil and other oils for substitutes for petroleum are obtainable through the hydrogenation of coal. Among them are chemicals used in the manufacture of drugs, dyes, explosives, plastics, perfumes and others. The display is of products made at the experimental coal hydrogenation plant of the U. S. Bureau of Mines at Pittsburgh. (U. S. Bureau of Mines)

*Presented before the Interstate Oil Compact Commission, Pittsburgh, June 26, 1943.

**Gulf Research & Development Co., Pittsburgh.

the use of larger proportions of alcohol would increase costs still further. These figures are based upon costs and do not include profit; they compare with a present cost of about 5c per gal. for petroleum motor gasoline.

Turning to a discussion of shale oils from oil shales, a welter of confusing "facts" may be found. At various times in the past, especially when petroleum shortage seemed to threaten, much attention was paid to this subject. Unfortunately, little *scientific* attention has been given to this topic in this country since shortly before 1930, and petroleum technology since that date has developed to such an extent that in most cases complete credence cannot be given to this early work, which does, however, serve as background material. Complete clarity does not exist in the public mind as to the identity of oil shales, which are often confused with oil sands. In oil shales no oil is present as such; instead there exists, usually as a relatively small fraction, a complex organic "pyro-bitumen" called kerogen, which breaks down when the shales are heated to yield petroleum-like oils, or which may be removed from the shales by such methods as extraction or hydrogenation.

Abroad, where commercial operations have been conducted on a rather small scale (by American standards), it has been the practice to obtain oils from the shales by heating them in retorts of various types, then refining these oils by modifications of standard petroleum techniques. Using such methods, considerable quantities of shale oils have been produced in such countries as Scotland, Esthonia, and (most recently) Australia. The economics of such production have varied widely, since the oil content of shales throughout the world is far from uniform, those of Australia being unusually rich and those of Scotland being comparatively poor.

Many American shales can yield a barrel of oil per ton of shale, an intermediate figure. In only a few cases have costs been competitive with petroleum, and even in these instances this has been true largely because crude petroleum was unobtainable locally and had to be imported.

Early Research Extensive

Turning to the American picture, commercial production never has actually been attained, although a large amount of early research by private agencies and the Bureau of Mines was conducted through the pilot-plant stage, using modifications of foreign techniques. American oil shale reserves are estimated at 400,000,000,000 tons, capable of yielding over 100,000,000,000 barrels of shale oils, which in turn might yield up to 60,000,000,000 barrels of gasoline. Most authorities seem to agree that shale oils can be produced, even by older techniques, at costs not exceeding $2 per bbl. (estimates ranging from $1 to $2), and that gasolines of comparable specifications to those currently demanded can be produced at costs in the vicinity of 5 to 12c per gallon.

Modern petroleum technology would seem to indicate that such figures might be sustained in actual practice. Revolutionary new techniques in the handling of solids, analogous to the fluid catalyst process, may even make shale oils competitive with petroleum after adequate research is conducted. Hydrogenation of shale oils, analogous to the hydrogenation of crude residues or low-grade crudes, might prove of interest, although other modern methods of refining such as catalytic cracking, reforming, and polyforming might be especially adaptable.

By-products from shale oil refining are also worthy of mention, since large quantities of phenol, cresols, and cresylic acids, which are valuable for the production of plastics, may be obtained. Steel requirements per barrel of gasoline per day probably would be lower than for the production of other petroleum substitutes.

It has been estimated that for a plant to mine the shale, then retort it to yield oil, and then thermally crack the oil to yield gasoline, the approximate dollar investment per barrel of motor gasoline per day might be on the order of $1500 to $3000. It must be noted that the comparable figure for the petroleum industry would have to include expenditures for producing facilities and oil transportation as well as refining plant investment; this figure was approximately $2500 in 1937, i.e., of the same order of magnitude. Such refining techniques for shale oils as hydrogenation would require a higher investment per barrel per day.

Future Seems Promising

Considerable research probably would be required before a sound shale oil industry could be established, however, even though the future seems promising, since far less work has been done on this method than on the hydrogenation of coal or the hydrogenation of carbon monoxide. Other problems, such as the disposal of spent shales, must also be considered, as well as the establishment of what would have to be a vast new mining industry.

Unfortunately, all of these petroleum substitute methods seem to look to the future. For any of them, plants probably could be erected immediately (if materials of construction were available), but such plants might be extremely wasteful of construction materials and labor, and it seems probable that their products would be highly uneconomic and, in some cases, of uncertain quality. Should petroleum be needed desperately, however, it may be necessary to resort to some such measures, which effort would bear indirect analogy to the erection of the synthetic rubber industry and might be accompanied with similar explosive consequences.

Meanwhile, the petroleum industry is making every effort to encourage both increased production of petroleum from known sources and the discovery of new supplies, confident in the fact that, given adequate research, methods do exist that will produce substitutes for petroleum in the future.

Undermining of oil shale formation at the foot of an escarpment in the Rocky Mountains, Rulison, Col. Oil shales in the N. S. are estimated as capable of yielding over 100,000,000,000 barrels of oils, if necessary to supplement our petroleum reserves. (U. S. Bureau of Mines)

For Refinery Equipment

Maintenance, Instead of Replacement, is Growing Wartime Necessity. Examples Given of How Oil Companies are Conserving Critical Items by Application of Electric Welding.

Conservation of steel valves, a most critical refinery equipment, is being effected by an Ohio refiner and maintenance time and cost saved, by arc welding new linings on valve bodies and new surfaces on faces of flanges and bonnets.

Conservation of heat exchangers, also among critical plant equipment, was achieved by another Ohio refiner by restoring corroded baffles by welding on partial or auxiliary baffles; in another case, by repairing a cast iron floating head on a heat exchanger by making a new head from electric welded steel.

The same refiner improvised a boring and seating tool, fabricated from scrap iron in the plant machine shop, by which such valve repairs as boring, reaming or seating can be quickly done, at much less cost than other methods for repairing or replacing the steel forgings.

Two obsolete absorbers were combined by welding, by a southwestern engineering firm, into a new 20,000,000 cu. ft. per day absorber of the design needed for recovering the lighter hydrocarbons desired in today's processing.

Details of these equipment conservation achievements and cost data are given below by the engineers and technical workers in charge of the work.*

Alloy Linings Welded in Valve Bodies; New Flange Surfaces Deposit-Welded

By Everett E. Kerns, Manufacturing Dept., Standard Oil Co. of Ohio, Cleveland, on leave of absence with Construction Dept. PAW, Washington.

Definite limits have been established by inspection departments for metal thicknesses of valve bodies for the various service conditions. When these thicknesses are reached the inspector condemns the valve and a new one is installed.

In recent years this practice has become almost a thing of the past. Now the valve is removed from service just before the metal thickness reaches the condemning stage and is sent to the machine shop where the machinist takes a light cut from the run-of-the-body to smooth the surface. A machine cut is also made on the faces of the flanges from the port out beyond the gasket groove.

With these operations completed, the valve body is sent to the welding department where a tube of stainless steel material, either 11-13% chrome or 18-8 chrome nickel, is inserted in each end of the run-of-way. These tubes extend to within ⅛ in. of the back side of the seats and flush with the faces of the flanges at the other ends. The electric welder then welds the outer end of these tubes to the valve body with stainless steel electrodes of 25-20 chrome nickel. The alloy deposit is carried out over the face of the flange beyond the outer edge of the gasket surface. This portion of the flange is built up with deposit weld metal to a depth of some ⅛ in. higher than the original face of the flange.

Due to the non-uniformity of the bonnet section of the valve, it is rather difficult to install any kind of sheet lining material, so here the welder proceeds to deposit-weld the stainless steel wire over the entire surface, extending all the way from the edge of the bonnet flange to the top of the seats. This deposit is also of 25-20 chrome nickel and will approximate 3/32 in. in thickness. A thicker deposit is necessary in the guide sections which serve to keep the gate in position during its travel.

Oftentimes when new seats and gates are not available, they are also given a light machine cut and are then built up with alloy deposit metal and re-machined.

About a year ago we began using the 25-20 chrome-nickel electrode, which has advantages over the 18-8 rod formerly used. The greater ductility of the higher alloy rod and the improved machining qualities make this alloy much superior. No failures of the welds resulting from stresses have occurred during this period. The best type of workmanship results from machining this ductile weld metal, which makes a smooth surface for the gasket, and thereby reduces any possibility of leakage.

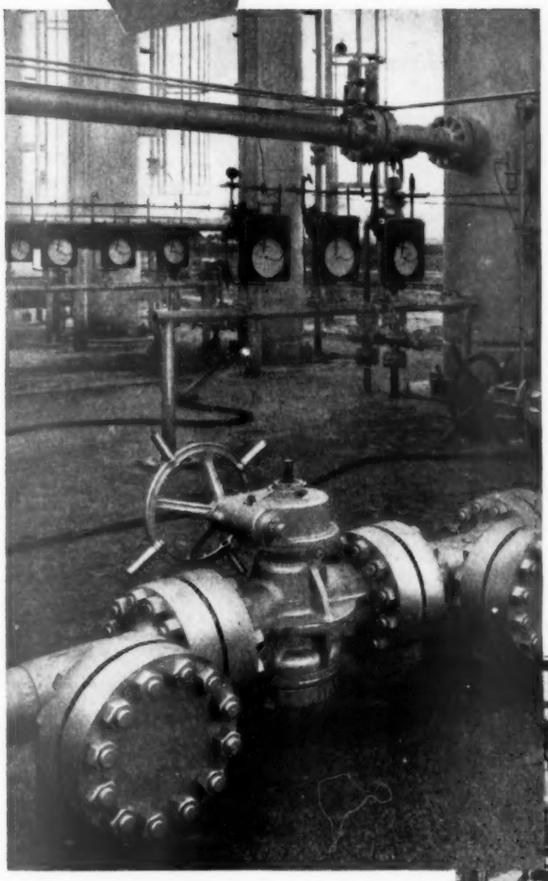
After the welding operation, the valve body is returned to the machine shop where the faces of the flanges are machined to the original dimensions. This completes the operation and gives us a carbon steel valve completely lined or protected with corrosion resistant material which is good for years of service. Five or six years ago this same valve body would have been sold for junk and replaced by a new valve of the same material costing about $300 for a 4-in. size. The cost of lining will average about 25% of the cost of a new valve and, when considering the thousands of dollars invested in such valves, the remaining 75% represents savings running into large figures.

These savings are not only measured by the difference between the repair costs and the

* From contributions by the individual authors in the Lincoln Arc Welding Progress Award Prgoram of Lincoln Electric Co., Cleveland.

SIMPLIFICATION ★ A VICTORY AID!

X = the Worry Factor!

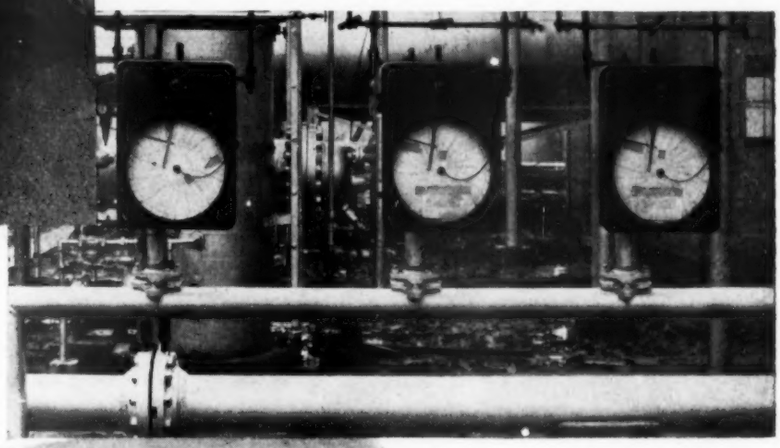


QUANTITY *and* quality . . . speed *plus* accuracy . . . are demanded in the industrial war output.

For years, the petroleum and gas industries have been schooling themselves in efficiency of production . . . aimed at lower operating costs. With this pre-war experience, the industry stands ready and able to do the job now expected of it.

Adequate measurement and control instruments are vital as never before. The worry factor is eliminated by utilizing Metric-American orifice meters . . . instruments of *known* accuracy and dependability.

Consider, for example, its large float area . . . with the wide clearances which prevent loss of accuracy through capillary attraction or any possible dirt collecting in the mercury. Only one of many features that insure sensitiveness, close registration and ruggedness . . . sustained high accuracy without coddling!



Metric-American orifice meters in distillate plant featuring high-pressure control, with utilization of gas expansion for refrigeration to step up distillate recovery efficiency.

METRIC METAL WORKS • ERIE, PENNSYLVANIA

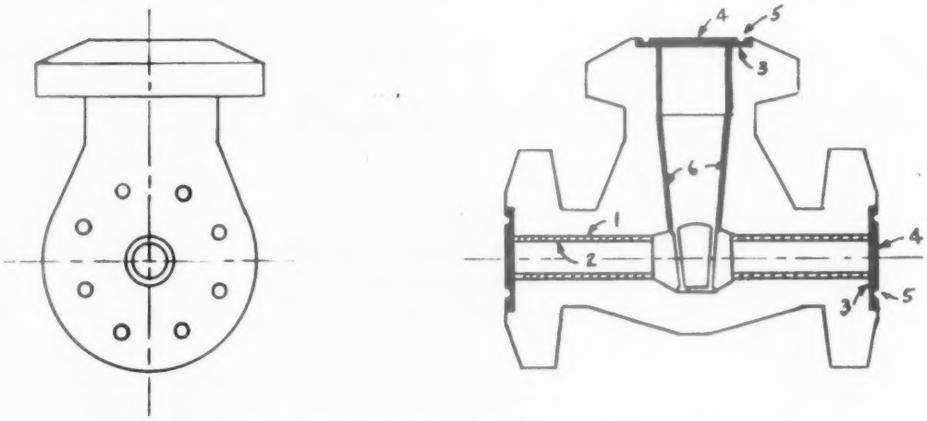
AMERICAN METER COMPANY

INCORPORATED (ESTABLISHED 1836)

MEASUREMENT ENGINEERING AND PROCESS CONTROL

Complete literature is available on the specifications, installation and operation of Metric-American orifice meters, flowmeters and control instruments. Write for it.

1935



Alloy Liner for 4-In. Forged Steel Gate Valve

Steps in the relining operation shown are:

1—Bore inside of valve run-of-way to "true up" the surface.

2—Alloy sleeve of 11-13% chrome or 18-8 chrome nickel is pressed tightly into place to within ⅛-in. of seat rings and flush with face of flange.

3—Machine face of flange for deposit weld metal.

4—Alloy deposit weld metal of 25-20 chrome nickel. After depositing, the surface is machined to the original dimensions of the flange.

5—Ring joint groove machined in the deposited weld metal.

6—Deposit weld metal 3/32-in. thick—not machined—in bonnet section.

value of a new valve, but also by the saving in operation costs. Such repairs can be made within a 3-day period, and under normal times the delivery of a new valve would take much longer. When considering loss of production by not having a valve ready for installation at the right time, we are again speaking in terms of thousands of dollars. Today, this is a far more important item since deliveries are in terms of months instead of weeks.

Another item worthy of consideration is the saving from a maintenance standpoint. A record is kept of the location of all lined valves, and where formerly the valves had to be taken apart at 30-day intervals for inspection purposes, now a lined valve may be installed and left in service for periods of 6 months or longer with no maintenance cost whatever. We have a number of lined valves that have been in constant service for 5 years and have required no maintenance except for disassembling at infrequent inspection periods. This item alone aids materially in reducing the "off time", thereby returning the unit to operation with a minimum loss of time.

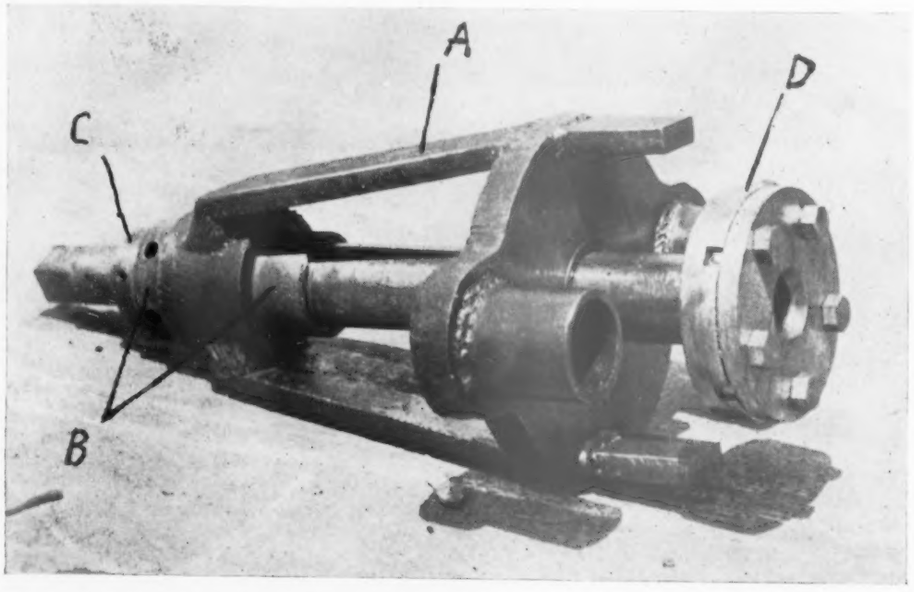


Fig. 1—Tool for valve seat repairs on pumps: A, frame welded from steel plates; B, bronze feed screw and bearing; C, retaining collar; D, cutter head, welded to 2-in. diameter shaft and ring clamping 5 bits in place

Boring, Seating Tool For Valve Repairs

By George M. Heath, Mechanic, Pure Oil Co., Toledo

During the semi-annual inspection of one of the refinery units it was discovered that the walls of the valve chambers of one of the pumps charging the cracking stills, was cut away. This cutting was the result of corrosion, probably accelerated by turbulence. This pump is of the horizontal duplex forged steel type, pumping heavy gas oil at the rate of 250 gals. per minute at 800 lbs. pressure and approximately 700° F. temperature.

Since time is always at a premium in an oil refinery, and in these days of steel shortages, rationing, and priorities, the replacing of this steel forging was out of the question. Since the problem was one of repairing the forging, we had the choice of sending it to a local shop for machining or to do the work in the place. The latter course was decided upon and it was then necessary to devise a tool capable of doing the work in a suitable manner. The tool shown in Fig. 1 was the result.

This boring and seating tool was fabricated of steel plate salvaged from scrap. Its main requirements were that it had to be rigid enough to withstand the stress of machining the 6-inch diameter seat, which had been coated with stainless steel, without chatter and in the least possible time. It required approximately 4½ man hours cutting and welding time. The shaft is 2 in. in diameter, turns in bronze bearings, has a cutting head 5 in. in diameter, and carries 5 inserted tool bits as cutters. The use of the odd number of cutters insured the machining of the seat without chatter. An excellent job was obtained and a perfect seal made without lapping.

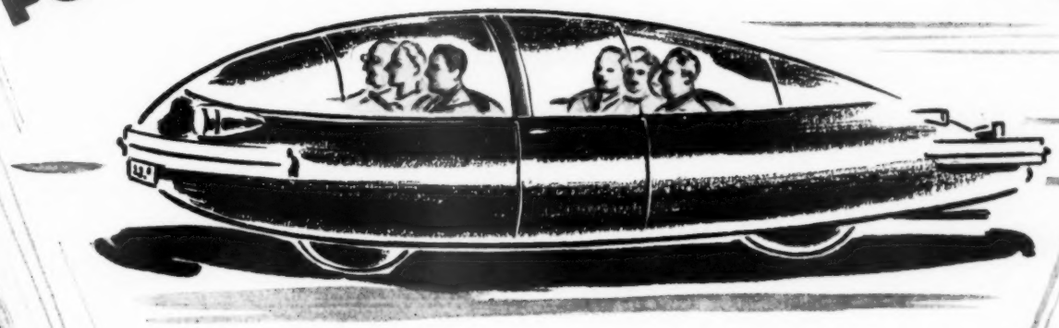
The pump body was first machined or ground to a depth of ⅛ in. from original dimensions. A coating of Lincoln Stainweld "D" was applied and the hole was rebored and reseated to original dimensions. Stainweld "D" was used as it resists corrosion and cutting action of the particular liquid which this pump handles.

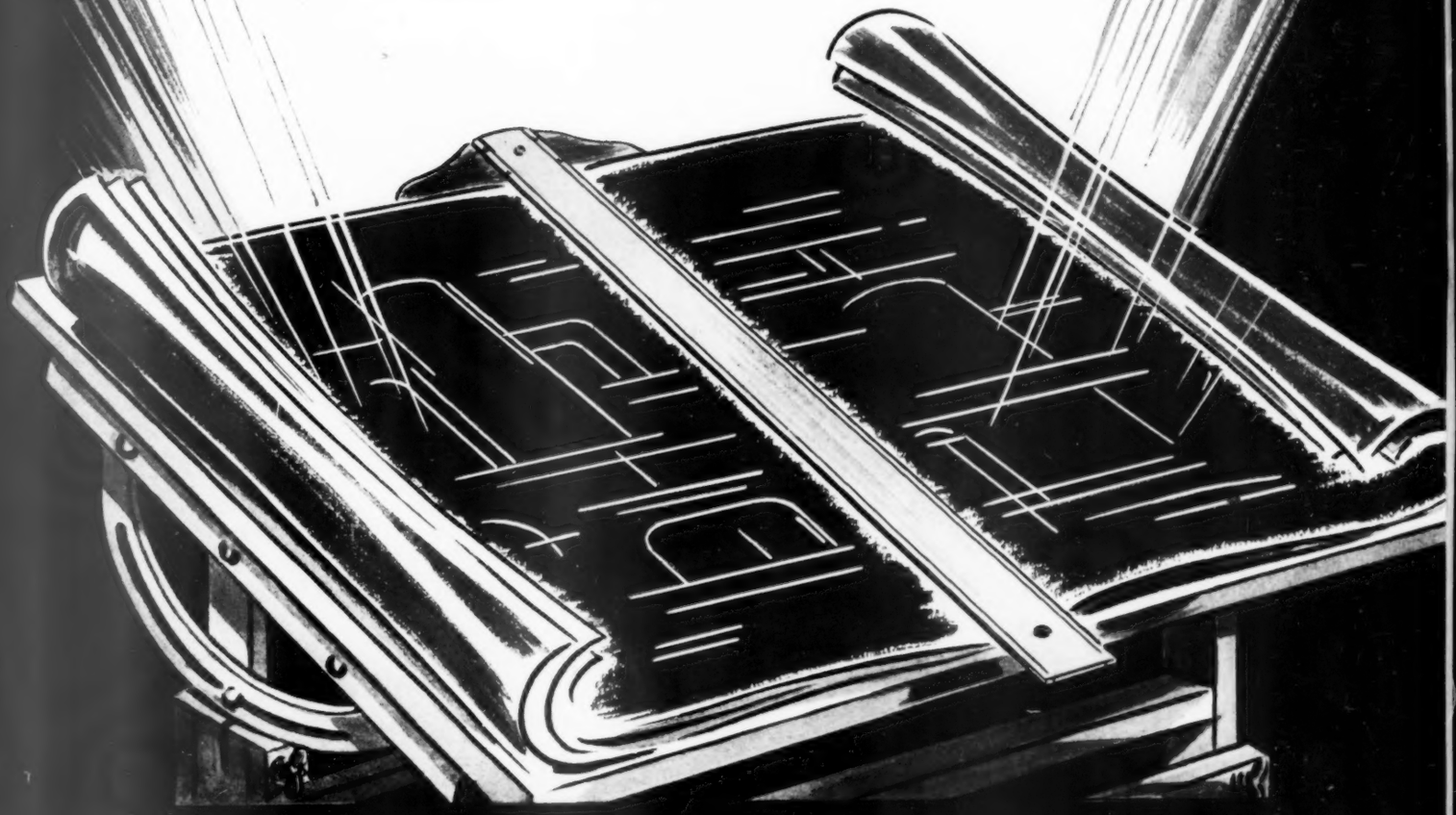
To replace this large forging would have cost several hundred dollars which shows the advisability of repairing the old forging by one means or another.

Analysis of the cost figures indicates the savings in time as well as in cost by using the arc welded tool amounted to approximately 83% when compared with the job.

Since we have a number of these pumps, this tool can be used for future valve seat repairs. It can also be adapted to making similar repairs such as boring, reaming, or valve seating in almost any type of similar equipment by changing the base used for securing the tool to the part to be machined, or by changing the cutter head in form, size, or number of cutters for the best results in the particular job being performed.

FOR THE CAR OF TOMORROW





95-100 OCTANE MOTOR GASOLINE

with less than 3 cc's of lead

TOMORROW'S MOTOR GASOLINE IS HERE !

400 END POINT

10 POUND REID VAPOR PRESSURE

95-100 RESEARCH OCTANE NUMBER WITH 1 to 3 CC'S OF LEAD

Thermofor Continuous Catalytic Cracking Process*, with T.C.C. Bead Catalyst, makes it possible to produce high yields of this high quality motor gasoline by cracking gas oil once-through or re-cycling.

T. C. C.
The War-Time process with the peace-time pay-off

THE LUMMUS COMPANY • 420 Lexington Avenue, New York
400 S. Michigan Ave., Chicago, Ill. • 634 S. Spring St., Los Angeles, Calif.
70 Bam Hill, Wembley Park, Middlesex, England

*Licensed by Houdry Process Corporation

LUMMUS

PETROLEUM REFINING PLANTS

Heat Exchanger Restored to Service By Welding on Partial Baffles

Repairs are described to a heat exchanger in service as a crude oil preheater in a combination high pressure cracking unit. The outside of the original tubes of carbon steel became corroded by the hot heavy gas oil after a few months' service and they were replaced with 4-6% chromium tubes and at the same time the upper 10 baffles were replaced. The balance of the baffles, 28 in number, were not removed at that time but soon became corroded to such an extent the unit failed to function properly. These corroded baffles were restored for service by welding in partial or auxiliary baffles.

By W. H. Parlette, Assistant Maintenance Foreman, Pure Oil Co., Toledo, Ohio

When purchased new, the exchanger under discussion was built completely of carbon steel tubes, tube sheets, baffles, tierods and spacers. It was placed in service on a combination high pressure petroleum cracking unit as a crude preheater in which hot heavy gas oil served as the heating medium, the crude being on the tube side and the hot gas oil in the shell side, i.e., outside of the tubes. The latter, as is frequently the case, proved to have a severe corrosive action upon the tube bundle, particularly in the vicinity of the shell inlet where the hot gas oil first comes in contact with the tubes. It was not many months before it was necessary to retube the entire pack because of severe leaks through the corroded tube walls.

This was done, replacing the carbon steel tubes with tubes of 4-6% chrome steel, which has excellent corrosion resistant properties when used in this particular service.

At the same time, due to their badly corroded condition, the upper 10 baffles on the pack were replaced with 4-6 chrome baffles. The balance of the baffles, 28 in number, were not renewed because they were at the time in good condition.

However, these baffles became corroded to such an extent that the hot gas oil, instead of being directed back and forth through the tube bundle as it normally would by sound baffles, merely swept down the comparatively clear space between the tube bundle and the exchanger shell to the outlet. This finally gave such a small transfer of heat to the crude charge to the cracking unit that a shutdown was necessary.

Fig. 2—One of the restored baffles completely assembled, the adjacent one half assembled, preparatory to welding

Replacement of the 28 corroded baffles would have entailed cutting down the pack and completely rebuilding with new 4-6% chrome baffles and 392 new 4-6% chrome tubes, each of which would cost $7 or a total of $2744 over and above the cost of the 28 new baffles. Because of the good condition of the existing 4-6% chrome tubes in the pack, it was evident that, if possible, this added expense should be avoided or at least postponed until the absolute useful life of the tubes had been realized.

The new tube wall thickness in this case happened to be 12 B.W.G. which is approximately 7/64 in. The maximum loss in wall thickness due to corrosion did not exceed 1/32 in. It was therefore evident that well over 50% of the useful life of the tubes would be lost if the tube bundle were cut down completely and retubed. It would thus represent a net loss of over 50% ($1372 or more) of the cost of the new tubes.

In order to avoid this loss it was decided that the corroded baffles could be satisfactorily restored by welding on partial baffles adjacent to the original baffles in the manner shown in Figs. 1 and 2. The interior portions of the original baffles were in fairly good condition because they were well protected from corrosion by reason of the accumulation which built up in the pack after the outside of the baffles had corroded away. Because of this fact, a comparatively tight baffle would result after our repairs were complete, and any leakage which would result would be of minor consequence because the hot medium would at least be directed between and around the tube surfaces.

The first step in making repairs was to clean thoroughly the tube bundle. When this was done the exposed corroded portions of the original baffles were cut away. Next, the new partial baffles were flame cut from ¼ in. carbon steel plate, and the 3/16 in. spacer bars were cut to length and milled on the ends to fit over the ¼ in. baffles. These parts were then assembled in the proper position on the tube bundle and welded in place. Both halves of the partial baffle were welded together and the spacer bars welded securely to the baffle at both ends. Tierods were also inserted through the round holes in the partial baffles. The baffles were then securely welded to these so that they would remain properly spaced on the pack.

At this writing, all the work involved in restoring the tube bundle has not been completed, and for this reason no actual cost of the completed job can be presented. However, the total estimated cost of restoring the tube bundle to a serviceable condition is $360 and accumulated costs to date indicate that this figure is conservative. Based upon the net loss of $1372 (depreciated value of the existing tubes) which would have been experienced had the pack been retubed, it is believed that a total net saving of $1022 can be pointed to as a result of the repair work being performed.

While it is realized that the restored pack will not be the equal of a completely rebuilt pack, it will at least give two or three years more satisfactory service which would otherwise have been lost. This job could not have been undertaken had not facilities for arc welding been available. The cost of doing it any other way would have been prohibitive.

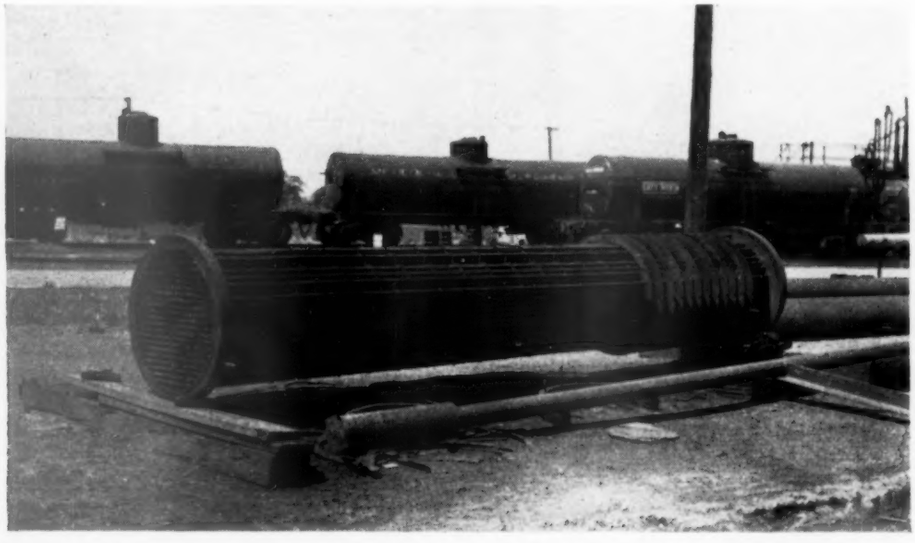


Fig. 1—Heat exchanger with corroded baffles trimmed away preparatory to beginning repair work. The baffles showing at right end are the 4-6% chromium baffles installed when the carbon steel tubes were replaced with alloy tubes

Dished Cast Iron Heat Exchanger Head Is Replaced with Arc-Welded Steel

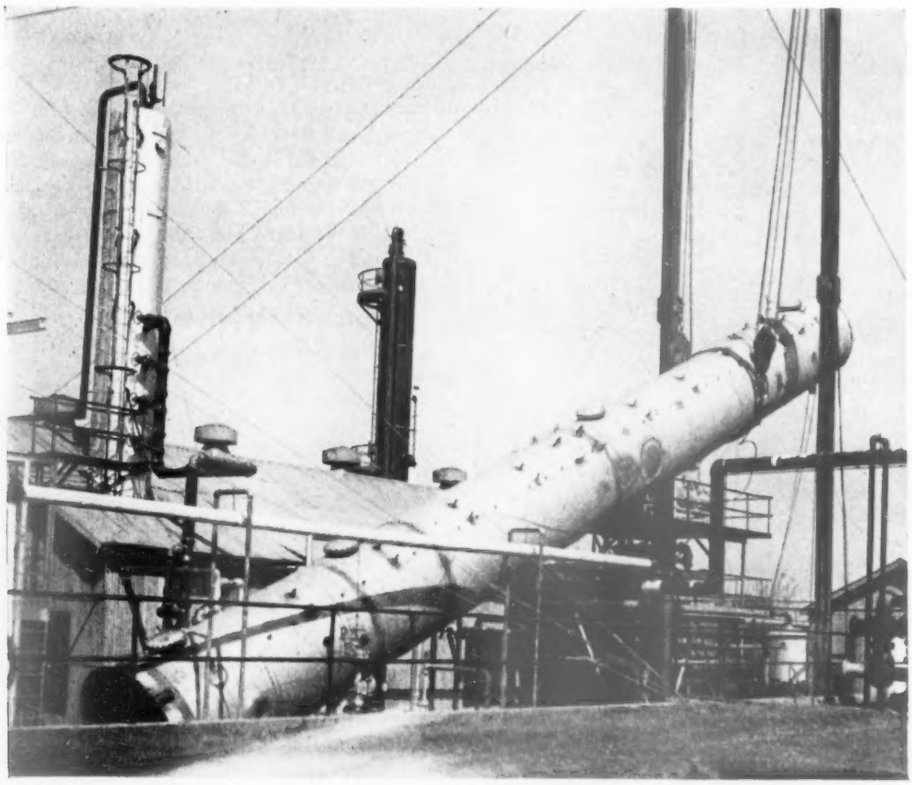
By Harold F. Steinman, Assistant Maintenance Foreman, Pure Oil Co., Toledo

Failure of the cast iron floating head on a heat exchanger used as a compressor intercooler caused the shutdown of a large gas compressor and a resultant delay in operations. This exchanger is 16 ft. long, 1 ft. 6 in. diameter, and contains 195 tubes having an outside diameter of ¾ in. and a thickness equivalent to 18 gauge.

To secure a replacement part from the manufacturer would have taken from 2 to 3 weeks, while a replacement from a local foundry would have involved 4 days. It was then decided that the cheapest and quickest method of repair was to make a new head from arc welded steel. Thus the design was converted from cast iron to arc welded steel construction.

As shown by the accompanying photograph the floating head was deeply dished at the center. To reproduce this section was the problem. However, upon checking the tube sheet, it was found this could be solved by using a thick piece of sheet steel for the flange, with a lighter plate for the dished head, which was easily formed by the blacksmith, to the contour required.

Upper and underside views of the cracked heat exchanger head and the welded head which replaced it



This absorber tower being put into place, 6 x 70 ft., weighing 56,000 lbs., designed for working pressure of 100 lbs. per sq. in., was fabricated by welding from two obsolete towers, 6 x 36 ft., 60 ibs. pressure

Two Obsolete Towers Made into Absorber

By L. L. Dresser, Dresser Engineering Co., Tulsa, Okla.

One of the major oil companies was recently faced with the necessity of installing a 20,000,000 cu. ft. per day absorber for the extraction of lighter hydrocarbons.

To complicate matters, under present conditions, months would have been required to obtain the critical materials necessary to fabricate a new vessel. In looking through their inventories, two 16-year-old, 6 ft. x 36 ft., 60 lb. working pressure obsolete absorbers were discovered. These vessels had been discarded some time ago because their design did not enable them to recover the lighter hydrocarbons now so necessary during our national emergency.

We were approached by the oil company to advise on the possibility of combining these two vessels into one, redesigning and rebuilding them in such a way that the redesigned vessel would meet their present needs. Investigation revealed that these absorbers were fabricated from ⅜ in. steel throughout, including heads. The rebuilt vessel would have to stand a working pressure of 100 lbs. per sq. in.; therefore, it would be necessary to replace the ⅜ in. heads with ⅝ in. steel.

To combine the two vessels into one, it would be necessary to remove both heads and the skirt from one vessel; on the second vessel to remove heads and cut the body into three sections so that they could be rearranged in the combined vessel without the loss of any tray surface. To avoid buying new heads, two second-hand, 6 ft. diameter, ⅝ in. thick tank heads were found which could be used to replace the original heads.

We were authorized to proceed with the redesigning and refabricating of these two vessels into a combined vessel, 6 ft. x 70 ft., or 56,000 lbs. total weight.

Saving of $5582

When the work was completed it was found that the cost of reconstructing was approximately $1750. The scrap metal value on the two vessels, based on $6 per ton, was $168. That, plus the cost of fabricating, made the actual cost of the redesigned vessel $1918. A new vessel, if it could have been obtained, would have cost not less than $7500; therefore, the cash saving to this oil company amounted to $5582.

The accompanying photograph of the rebuilt vessel indicates the various cuts and welding required to construct the redesigned vessel.

This piece of equipment is now operating with all the efficiency expected, extracting all the lighter hydro-carbons down to within .02 of a gal. per 1000 cu. ft., which is excellent recovery with any modern vessel.

Truly Universal

ALL catalytic and other petroleum refining processes, research and know-how are made available to every refiner and engineer contractor.

A licensee chooses his own contractor, U.O.P. works with both.

Experts train and educate the licensee's personnel in the new technique.

Technologists maintain continuous plant contacts to impart the latest techniques for the promotion of refining efficiency, progress, and safety.

Universal licensees build for the future.

U.O.P. is not a contractor, manufacturer or seller of equipment—but a pioneer in petroleum research and technology.

CATALYTIC CRACKING	HYDROFORMING
REFORMING	DEHYDROGENATION
HYDROGENATION	POLYMERIZATION
ALKYLATION	UNISOL TREATING
ISOMERIZATION	RETREATING
THERMAL CRACKING	SWEETENING
U.O.P. CATALYSTS	U.O.P. INHIBITORS

COMBINATIONS, MODIFICATIONS AND NEW APPLICATIONS
OF ALL THESE PROCESSES
NEW PROCESSES IN THE MAKING

OIL IS AMMUNITION—USE IT WISELY
Universal Oil Products Co.
Chicago 4, Ill., U. S. A.

CARE FOR YOUR CAR FOR YOUR COUNTRY
Petroleum Process Pioneers
For All Refiners

The Refiners Institute of Petroleum Technology

New Design Practices Recognized In Pressure Vessel Code Addenda

Changes in the recent addenda to the A.P.I.-A.S.M.E. Code for Unfired Pressure Vessels are discussed from the point of view of their practical effect on the design and construction of towers, reactors and similar refinery equipment and their fittings. Part 1 of this series, in the July 7th Technical Section, p. R-302, discussed revisions in material specifications, among other topics. Other changes in the 1942 addenda to the code will be reviewed in Part 3, in the September Technical Section.

Part 2 of Comment on Revisions

By E. F. Brummerstedt*

W-310, Head Design

In the 1942 addenda to the A.P.I.-A.S.M.E. Code for Unfired Pressure Vessels, the new sketch (g), to be added to Fig. 2 in code, showing a permissible method for attaching an intermediate welded head, covers a condition frequently encountered, wherein the shell thickness changes at the point of tangency of the attached head due to different pressures in the two compartments of the vessel. Since the head would be attached with the concave side toward the higher pressure compartment, T_2 must be equal to or greater than T_1. The length of the straight flange of the head must be equal to at least four times the thickness of the heavier shell, plus twice the thickness of the head, or S.F. $\geqq 4\ T_2 + 2\ T$.

The flange acts as a backing strip for the single butt-weld, which presumably is deposited in three parts, the first two being fillet welds attaching the shell plates to the head and the third filling in the remaining V-groove to a fairly smooth surface. The seal weld is optional, but would be desirable if the liquid in the vessel is corrosive. While the efficiency of this joint may be considered equal to the normal double-butt welded joint, it would seem more conservative, because of the nature of its deposition, to use only that of a single full-fillet lap joint.

This new method places no definite restrictions as to the thickness of either shells or head; these are limited, however, by the maximum available length of the head flange. Previously, internal heads, or heads convex to pressure, were attached by means of fillet and plug welds with the shell thickness limited to 5/8 in. No provision was made for such construction for shell thicknesses over 5/8 in. This revision permits the superposition of one tank above the other, with shell thicknesses within practical limitations, and hence will save an extra head and separate supports for the upper tank.

W-316a, Cover Plates

The thickness of bolted flat cover plates may now be determined from the ASA B16e Standards for blind flanges for the appropriate pressure-temperature ratings, with the specified corrosion allowance added thereto. Previously these thicknesses were allowed only for diameters up to 14 in. but now they extend over the whole range of A.S.A. Standard fittings up to and including 24 in.

For sizes and designs greater than 24 in., or not covered by the above standard, cover plates and unstayed flat heads shall continue to be calculated by the original formulae in W-316, with a modification in the value of W, as explained in W-317 (revised).

This revision confirms the growing conviction that A.S.A. Standard Blind Flanges are adequate in all cases for their respective pressure-temperature ratings and eliminates the necessity of tedious thickness calculations for these standard sizes.

W-317, Bolted Flanged Connections

This section was completely rewritten, and due to its length cannot be reproduced here. Its main feature is the mandatory provision that all such connections with dimensions other than A.S.A. standard mentioned above shall be designed in accordance with the rules previously published in Taylor Forge Catalogue No. 423 under Modern Flange Design, and now also adopted by the A.S.M.E. Boiler Code and the industry in general.

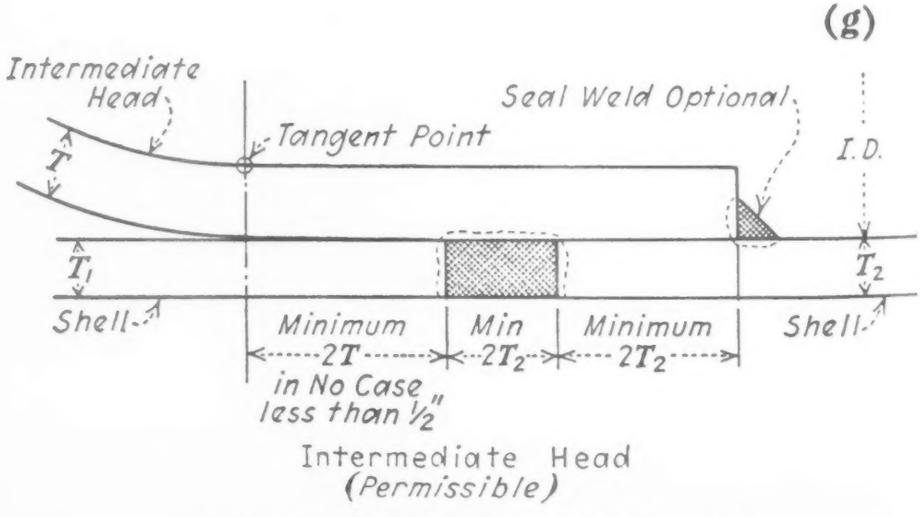
Of special interest is paragraph (e) giving the revised allowable design stresses in bolts. The allowable stress for carbon steel bolts has been reduced from 11,000 to 7000 psi., or to approximately 25% of the yield point stress. This specification increasing the safety factor is the result of frequent failure of carbon steel bolts due to the common tendency of workmen to use wrenches which overpull the bolts in tightening, causing elongation far in excess of operating stresses and corresponding strains. In order to avoid this the additional recommendation is made that bolt diameters be at least ½ in.

Accompanying Table 1 from Sect. W-317 (e) of the addenda gives allowable stresses for high-temperature bolting material. These stresses are also based on a factor of safety of four.

Another change is in the factor W, the flange design bolt load. This is now specified to be not less than the average of the required bolt load for the maximum operating conditions and the actual bolt load available where bolts are stressed to the maximum allowable working stress. As stated in Note 5, this provides a margin against abuse from overbolting of 50% of the excess above the required minimum. It also saves flange material, since it does not require the flange to be designed for the full strength of the actual bolt load, which may sometimes be considerably in excess of the minimum required bolt load, especially for low pressure services.

Tables A and B, indicating the gasket and effective width factors, required no comment. They are based on experimental data furnished by Taylor Forge and taken from their catalogue (Note 1 states that they are not mandatory, however).

The method of design is given in great detail in the addenda and requires no additional explanation. Note 6 under paragraph (i), referring to design stresses, states that for the present no consideration has been included for casting quality factors, weld metal efficiencies, etc. The designer is referred to the new A.S.A.



New sketch (g) to be added to Fig. 2 in the code (W-310)

*Petroleum Refinery Division, Foster Wheeler Corp., New York.

War Standard mentioned in Part I of this series, where a casting factor of 90% is specified for use during the emergency. Weld metal efficiencies may be obtained from paragraph W-318.2 of the Code.

W-329f, Distribution of Reinforcement of Single Openings

The parenthetical clause in the first sentence has been changed to read: "(computed by multiplying the area of reinforcement in that plane by the working stress existing in the shell or head being reinforced and acting perpendicular to the plane, a proportionally increased area being used if the added reinforcement has a lower working stress than the metal removed)".

This is a correction specifying that the strength of a reinforcing pad be equal to its area times its working stress, instead of its tensile strength. Provision is made for using a metal of lower allowable stress as reinforcement, for infrequent cases where the same metal may not be readily available. It is standard practice to use reinforcing metal identical with the shell or head material being reinforced, however, and a substitute metal would presumably be used only in field repairs.

W-329h, Strength Required in Welds for Reinforcement of Single Openings

The second sentence of (3) (b) has been revised to read: "The strength of fillet welds shall be computed using the strength of the steel in shear, the fillet weld size (i.e., length of leg), and the stresses as given below, multiplied by the joint efficiency (See Fig. 17)."

This revision requires careful consideration in view of the generally accepted theory that the strength of a fillet weld is based on its minimum cross-sectional plane, which in shear is through the throat as shown in Fig. 17. This figure applies primarily to straight-line fillet welds, however, where shear failure is possible along the plane of the throat. In the case of circular fillet welds around nozzle necks and pads, shear failure would presumably occur at the outside surface of the shell along a line X—X as shown in Fig. A. Simultaneous shear failure all around the throat of a circular fillet weld appears to be extremely improbable. This revision appears to apply, therefore, to the strength of fillet welds around nozzles and reinforcing pads.

Paragraph W-333 of the code, however, specifies that when butt or fillet welds are used for structural attachment, such as skirts, lugs, brackets, etc., their strength shall be computed as specified for opening reinforcement in W-329h. Here again the above revision would appear to apply only when shear failure would occur on a plane along either leg of the fillet; if it could occur along the plane of the fillet's

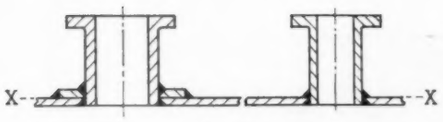


Fig. A

throat, as in Fig. 17, the strength of the weld should be calculated accordingly for the worst condition.

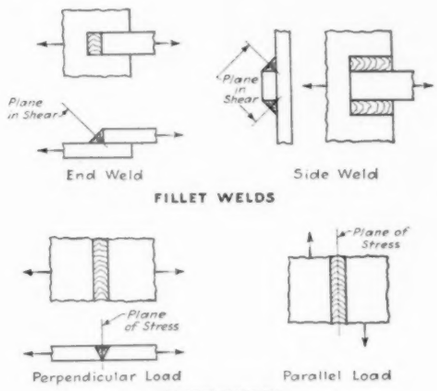


Fig. 17—Test specimens for tension tests

It is to be noted that on Page 32 of the addenda (Appendix D) the shear strength calculations are revised in accordance with the above revision for the sample computation covering the design of reinforcement for a single opening in the shell of a vessel. In addition to the shear area the efficiency of the fillet weld has been corrected from 69% to 58% for a single full fillet lap joint. (Refer to Table 1 of the Code, Page 39).

These corrections should apparently also apply to Appendix E, the sample computation covering the design of reinforcement for two shell openings with overlapping areas of reinforcement. (See Page 176 of the Code).

W-335a Supports

The third sentence has been revised as follows: "Care should be exercised that these supporting lugs, etc. do not cause excessively stressed areas in the shell or head sections to which they are attached."

The restrictions regarding the position of the supporting lug welds parallel to welds in the vessel wall have been removed. These restrictions were sometimes impractical to comply with and apparently were not deemed to be of sufficient practical importance to justify interference with the speediest and most economical fabrication of the vessel.

(Part III of this series, covering remaining changes in the 1942 *Addenda, will be presented next month).*

TABLE 1—Allowable Stresses for High-Temperature Bolting Material

(From Sect. W-317(e) of 1942 Addenda, A.P.I.-A.S.M.E. Code for Unfired Pressure Vessels)

Metal Temp. Deg. F.	A.S.T.M. A96			S.A.E.		A.S.T.M. A193	
	Class A	Class B	Class C	1000 series	1300 series	Grade B7	Grade B7a
UP to 400	17,500	20,000	25,000	17,500	20,000	25,250	25,250
650	16,250	18,750	20,000	16,250	18,750	20,000	20,000
700	14,950	17,200	18,400	14,950	17,200	20,000	20,000
750	13,650	15,650	16,750	12,500	15,650	20,000	20,000
800				10,000	12,500	20,000	20,000
850				6,900	9,750	16,250	17,250
900					7,000	12,500	13,750
950						8,500	10,300
1,000						4,500	7,300
1,050							4,800
1,100							2,750

BOOK REVIEWS

How to Build Chemical Laboratory Apparatus

"Chemical Engineering Laboratory Equipment; Design, Construction and Operation" represents the pooling of knowledge and experience of men in leading universities in the U. S. in the design and construction of equipment for chemical engineering investigations. It is a valuable addition to present literature in that it presents, in detail, instructions for developing laboratory equipment for a definite type of experimental work, thus saving time for investigators in the field who must construct such equipment under press of war work. Methods of calculation are included, collected from most of the recognized reference works on the subject.

Collection, arrangement and editing of contributions was carried out by O. T. Zimmerman, professor of chemical engineering, University of New Hampshire, and Irvine Lavine, formerly professor of chemical engineering, University of North Dakota. Contributors include heads of chemical engineering departments in some 20 universities.

This book contains 485 pages of text with 163 illustrations, a 27-page appendix containing 22 tables of information and an 18-page index. It may be purchased through the Book Department of NATIONAL PETROLEUM NEWS, 1213 W. Third St., Cleveland, for $5.50, postpaid.

4th Revision of Listing Of Physical Properties

At the request of the Technical Advisory Committee of the Petroleum Industry War Council, a fourth edition of "Physical Constants of the Principal Hydrocarbons", compiled by M. P. Doss, Technical and Research Division of The Texas Co., has been prepared. The tables provide laboratory workers with a ready reference for information which too often requires a long search through the available handbooks.

The third edition, issued in March, 1942, contained 215 pages and listed properties of nearly 2000 hydrocarbons. In the new edition more than 100 pages have been revised to include new or corrected data, particularly on the hydrocarbons related to the manufacture of aviation gasoline, synthetic rubber, synthetic resins, toluene and other hydrocarbons.

While the tabulation does not purport to be complete, states the introduction, yet it is believed that most of the aliphatic hydrocarbons so far isolated or synthesized are included. "This also holds true to a lesser degree for the cycloparaffins (naphthenes) and such unsaturated ring hydrocarbons as the cyclo-olefins, etc., as well as the mononuclear aromatics," it is stated. "However, only the principal members of the polycyclic series are given, mainly those that have actually been isolated from petroleum residues, etc., such as picene, pyrene and anthracene".

The book is available from The Texas Co., 135 E. 42nd St., New York, at $3.75 per copy, which represents only the cost of printing and binding. Requests for copies should be addressed to Mr. Doss at the above address.

90,000-Ton Buna-

Project at Institute, W. Va., has rated capacity about equal to one-seventh of Nation's prewar consumption of natural rubber. Butadiene and styrene for copolymerization into Buna S manufactured at same location.

THE PHOTOGRAPH at left shows a row of bubble-tray towers where butadiene for synthetic rubber is purified, with heat exchangers in the foreground. The installation is part of the new government project at Institute, W. Va.; the units for butadiene and styrene recovery are operated by Carbide & Carbon Chemicals Corp., the copolymer plant by U.S. Rubber Co.

By D. P. Thornton, Jr.

ONE of the largest of the government-owned Buna S synthetic rubber plants, rated capacity 90,000 long tons annually and costing $56,000,000, is now in operation at Institute, W. Va. It is a part of the government program to provide 735,000 tons of Buna S and much smaller amounts of other types of synthetic rubber to replace our supply of natural rubber lost to the Japs.

The Institute plant is "integrated", in that butadiene is produced from alcohol, styrene from ethylene and benzene, and these 2 raw materials—butadiene and styrene—copolymerized to form Buna S synthetic rubber. It is also a cooperative plant: the long experience in chemicals manufacture possessed by Carbide & Carbon Chemicals Corp. was utilized to make butadiene and styrene, and the knowledge and experience of the entire rubber industry was pooled in the design and construction of a finishing or copolymer plant built and operated by the U. S. Rubber Co.

The Institute and other synthetic rubber plants are monuments to the research chemists and chemical engineers of the nation and their response to the war emergency. Styrene has been an industrial chemical for a number of years; polystyrene, a plastic made from it, is well known to the plastics trade. Butadiene was a subject of research as well as a raw material for limited chemicals manufacture prior to recognition of the rubber emergency. Intensive research in the production of both was initiated shortly after the beginning of World War II. Synthetic rubber, however, was not so well known although production and research in the manufacture of several types had its beginnings during World War I.

Has Shipped Million Pounds

At the present time more than 1,000,000 lbs. of Buna S has been made at the Institute plant and shipped to rubber compounders since March 31, 1943. More than 20,000,000 lbs. of butadiene have been made and shipped to the copolymer plant at Institute and to other plants since Jan. 29, 1943. Styrene production figures are not available, but the first of 2 units, with annual rated capacity of 12,500 short tons each, started initial operations April 13 and the second will be running in a short time.

Until April 2, 1942, the area where the Institute's plants now stand was a vacant field. Construction of the first butadiene unit began on that date. Ground was broken for the first styrene unit in July, 1942, coincident with beginning construction on the copolymer plant. Construction at the copolymer plant is not yet complete on the second of three units planned.

If the investment figure for these plants seems large, consider that the production of this amount of natural rubber, 90,000 long tons annually, would require a 270,000 acre plantation containing 24,000,000 trees, take 5 years to reach production. Such a plantation would cost approximately $80,000,000 to bring into production, necessitating the labor of 90,000 men. The Institute plants' personnel will comprise only 1250 people, and not all of these will be men. Women are used extensively in the laboratories, for example. Finally, initial production has been obtained within 30 months of inception.

How Butadiene Is Made

Although there are many ways of making butadiene, the process used at the Institute plant starts with ethyl alcohol. Again, ethyl alcohol may be made by any one of several processes, among them by synthesis from petroleum refinery gases, by fermentation of agricultural products, usually grain or molasses, and from the sugar which is carried by waste sulfite liquor in the production of paper. No production of alcohol of importance has thus far been achieved from sulfite liquor. The alcohol used now at the Institute plant comes from the fermentation of grain. Rated capacity for alcohol is 197,000 gals. per day, equivalent to an average corn crop from 720,000 acres.

The manufacture of butadiene is by the so-called "Union Carbide and Carbon process," which involves conversion of ethyl alcohol to acetaldehyde by catalysis followed by a second one-step combination catalytic polymerization and dehydration of the acetaldehyde to produce 1,3 butadiene[1].

The process, in keeping with war secrecy requirements, may be described as follows:

Alcohol, 190 proof or 95%, is vaporized in heat exchangers and charged under moderate pressures through a converter containing a catalyst. Effluent vapor from the first converter is charged to another for further conversion, and the final effluent is purified by distillation in bubble-tray columns to 98.5%

Plant

plus pure butadiene. Unreacted constituents separated in the distillation are recycled to the appropriate converter. The heating medium used here is diphenyl.

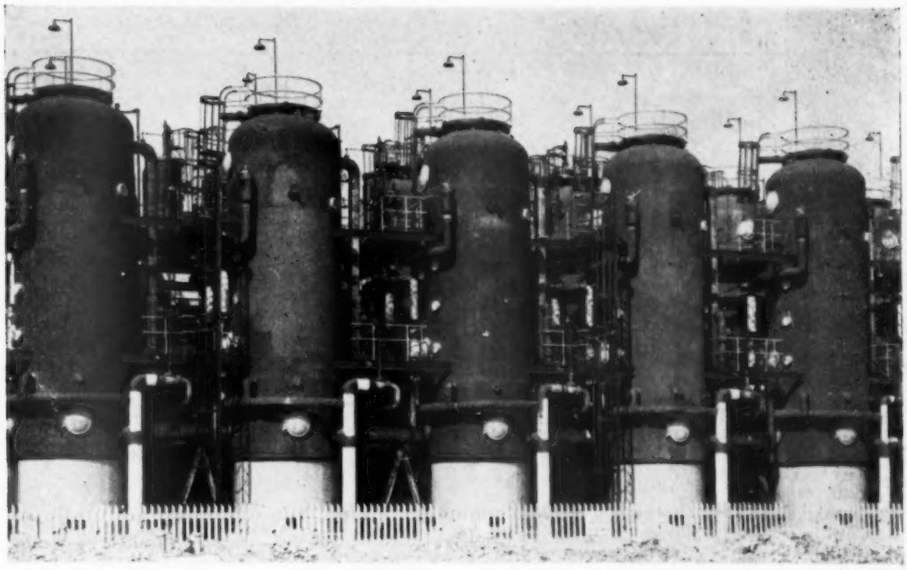
Butadiene Is Inhibited

In order to prevent self-polymerization, it is necessary to inhibit the butadiene. This is effected by addition of a special inhibitor, which must be removed before the butadiene can be used to make synthetic rubber.

In order that process economies may be kept at their highest efficiency with optimum conversion, an intricate control system has been installed. These controls, some of which are indicating-controllers and others recording controllers, operating both electrically and pneumatically, are installed on the second floor of the instrument house. On the first floor are located the compressors which handle the alcohol and vapors from the reactors during the various stages of the process. Close by the fractionator columns are located the pumps for distillation recycle and for discharging the butadiene to storage.

Wherever possible, extensive use of heat-exchangers is made to cut heat loss to a minimum. Nearly all types may be seen, including the simple tube-within-a-tube, U-bend, fixed

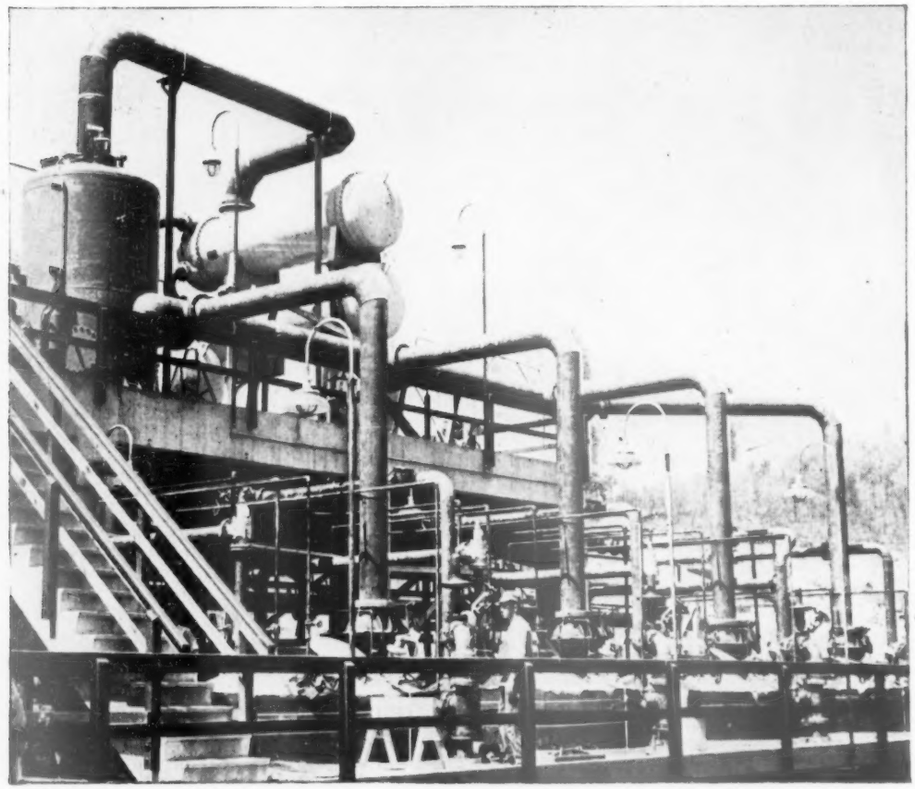
[1] Testimony before a subcommittee of the Senate Committee on Agriculture and Forrestry; the so-called "Gillette Committee".



Converters in one of the 4 butadiene units, where ethyl alcohol is synthesized into butadiene

Butadiene storage tanks, 250,000 gal. capacity each, are spherical to provide maximum pressure resistance with minimum of steel in their construction. They are provided with water spray arrangement for cooling in hot months

Styrene converters. In left background is a butadiene storage tank, next the water pump house and in right background the alcohol storage



Where unreacted butadiene is cooled, condensed and recovered. In foreground are visible the tops of blow-down tanks, where pressure is released from the reacted copolymerization mixture

head, and floating head designs. Several of these may be noted in accompanying illustrations.

Piping is kept to a minimum, although the photographs indicate a veritable maze of steel pipe of all sizes. In the interests of critical materials conservation, reconditioned steel from the old 6th Avenue "El" in New York City was used to support the pipes, while salvaged steel is utilized elsewhere in the plant where conditions permit.

In the diphenyl heating unit, control is through automatic recording and indicating controllers. Flow of diphenyl to and in the butadiene unit is controlled in the butadiene unit central control section, but provisions are made to permit practically instant emergency shutdown of diphenyl and butadiene units by remote control.

Pure butadiene, a liquid boiling at 26 deg. F. under atmospheric pressure, is stored in spherical tanks which are used to permit maximum pressure resistance with a minimum requirement of critical metal. These tanks are provided with a water-spray arrangement used during the summer months; otherwise the vapor pressure of the butadiene might exceed the 75 lbs. per sq. in. maximum pressure at which safety-valves are set. Butadiene is piped to the copolymer plant, or it may be shipped elsewhere in special pressure-type tank cars.

Alcohol storage at the Institute plant consists of 5 conventional tanks. Facilities are provided to receive alcohol either by tank car or barge; 5 barge mooring piers are available.

Styrene, or phenylethylene, may be made by one of several processes utilizing benzene and ethylene, or ethyl alcohol and benzene as raw materials and differing largely in the catalysts employed. An earlier method started with benzene and ethyl chloride, but present use of this method is frowned upon by the War Production Board because of the critical need of chlorine in production of other war-chemicals.

Benzene is derived from the destructive distillation of coal, or it may be produced from petroleum. Ethyl alcohol sources have been described elsewhere in this article. Ethylene is a by-product gas in refining operations, and also may be produced from natural gas as a raw material. Ethylene used at the Institute plant is produced from natural gas in Carbide and Carbon's chemical plant at South Charleston, W. Va., 12 miles away, and delivered by pipeline.

Alkylate Ethylene, Benzene

In making styrene, ethylene and benzene are alkylated to form ethyl benzene, using a catalyst. The ethyl benzene vapors, mixed with unreacted ethylene and benzene, then are purified in a series of fractionator columns and run to intermediate storage tanks. From intermediate storage, ethylbenzene is charged to additional reactors where it is catalytically converted to styrene.

It is of interest here to compare 3 processes for the manufacture of styrene, as reported by Dow[2]. One process, using ethyl alcohol and benzene as starting materials, reacts them to form ethylbenzene in the presence of a solid phosphoric acid catalyst at temperatures around 600°F. and pressures of approximately 250 lbs. per sq. in. In another, similar process, ethylene is substituted for ethyl alcohol, but the catalyst is understood to be the same. Still another process uses ethylene instead of ethyl alcohol and benzene under conditions of about 190°F. temperature and 15 lbs. per sq. in. pressure in presence of an aluminum chloride catalyst. The ethyl benzene vapors then are mixed with highly superheated steam and dehydrogenated to form styrene.

[2] Dow, W. H., NPN Technical Supplement, Jan. 6, 1943, p. R-46.

Use Precise Instrument Control

In the Institute styrene unit, the same plan of precise instrument control is followed as in the butadiene unit previously described. However, since the distillation of styrene for purification to specification requirements involves rather high temperatures, the distilling columns are not only insulated but housed in a building which also contains the main operating control room. On the first floor of this building are the necessary pumps for supplying benzene to the reactors, compressing ethylene, column reflux pumps, refrigerating compressors for the coolant used in chilling styrene prior to addition of polymerization inhibitor and pumps to run the styrene to storage. Also located here are steam jets to provide the required vacuum on certain parts of the processing equipment. Heat exchangers again are used extensively to provide heat economy.

The impure styrene from the reactors is distilled to 99% purity. In order to prevent autopolymerization, the styrene is kept chilled in insulated storage until an inhibitor is added. Tetralyn is used as the heating medium in the reactors, one heating plant serving 2 styrene units in the interests of process and critical materials economy.

That portion of the plant manufacturing Buna-S copolymer is entirely separate from the butadiene and styrene plants. It was built and is operated by the U. S. Rubber Co. for the Rubber Reserve Co. The plant was financed and is owned by the Defense Plant Corp. It consists of 3 independent units, each with a capacity of 30,000 long tons of rubber annually. It was decided that rather than build one big plant, it would be better to standardize on multiples of smaller units; thus, the same designs could be used with only minor changes in the construction of other plants for the rubber program. Moreover, use of multiple units gives the added advantage of less interference with overall production should something go wrong in some part of the process or equipment; the whole plant will not be paralyzed by the failure of an essential part.

Each of these units consists of several stages and these stages are "fanned out" into still smaller components again to preclude a bottleneck from failure of equipment.

Butadiene and styrene are received by pipeline from that part of the integrated plant previously described. If desired, however, both butadiene and styrene could be rail-shipped to Institute from other plants in this country, utilizing storage existing in that part of the plant now manufacturing these chemicals.

Supplies of catalyst, soap, caustic soda, sulfuric acid and other essentials are secured

by rail or by barge. The plant is equipped to make its own soap through the reaction of fatty acids with caustic soda.

First Step in Copolymer Process

The first step in the copolymer process is the individual making-up of all reactants, except for the butadiene and styrene. All are individually charged to the reactors. A soap solution is used as the emulsifying agent, and also as the "carrier" or medium in which the reaction takes place. Powdered soap is charged through proportioning hoppers into a measured quantity of hot water in a huge tank; after thorough agitation, it is charged to the reactors. Miscellaneous chemicals, including anti-oxidants and catalysts, are made up separately in a similar manner and also charged to the reactors. Butadiene and styrene then are added.

The final charge to the reactor consists of approximately 3 parts of butadiene, together with soapy water and fractional parts of catalyst and miscellaneous chemicals.

Keep Water to 60 Deg. F.

In this connection, each of the 3 copolymer units is equipped with a 60-ton refrigeration system to assure that temperature of the cooling water does not exceed 60 deg. F. even in summertime. Also, all proportioning of the reactants is done through recording meters of the preset type. These records, plus those from the temperature controllers and pressure indicators, give a complete process history of each batch. Should pressure become excessive in a reactor, safety valves "pop" the gases to large lines leading directly to flares located well away from the restricted areas of the plant. Pilot flames always are burning on the 150 ft.-high flare stacks to ignite "popped" gases.

Upon completion of the agitation period, the reactor charge is pumped to a blow-down tank and then passes to a series of foam knock-out tanks, where the gases (mostly butadiene) are vented. These tanks also are used in case a batch tries to "run away" and develop excessive pressure in the reactor.

The gases are of course recovered. The isolation of butadiene is accomplished by flashing at atmospheric pressure, since its boiling point then is 26 deg. F. Styrene, boiling at a temperature of 271 deg. F., must be recovered by boiling under a vacuum; otherwise, the latex-containing emulsion would be damaged if heated to a temperature sufficiently high enough to permit distillation of styrene at atmospheric pressure.

Change to Continuous Operation

Up to this point, the entire process has been a batch operation. The balance is a continuous process. Such a natural division point is made use of by providing large storage tanks to insure that the previous batch operations will not interfere with the continuous operations to follow.

The latex—or synthetic rubber, since it is now coagulated—then is freed from absorbed impurities; soap, some chemicals carried over from the original polymerization, brine and acid. This is accomplished in still another tank by washing with water into which steam is being continuously injected. The material is then dehydrated and passed through the drier and is then ready for the automatic baler.

The rubber, with a final maximum moisture content of 0.75% is compressed in the automatic baler, which exerts a pressure of 7500 lbs. per sq. in., into 75-lb. bales, 6 x 14 x 28 ins. The bales are packed in individual cardboard boxes, stamped with plant, batch number and other identifying insignia. The product is then ready for shipment to a rubber compounding plant as directed by Rubber Reserve Co.

Plant Utilities

In order to avoid duplication of considerable equipment and also to save critical materials at Institute, all steam necessary for processing and for employe comfort is generated in a single plant. This same plan is followed for water and the electrical utilities are confined to a single central distribution station. These will be discussed in the order of their listing.

Steam is supplied to the mains at 415 lbs. per sq. in. pressure and 575 deg. F. (approximately 100 deg. of superheat). Ordinary nut coal is pulverized to a fine dust and blown into the boilers under forced draft. On the stack side of the boilers induced draft is maintained, partly to increase combustion control and also as a part of the smoke consuming mechanism which prevents any "smogs" over the plant.

It requires 7700 tons of coal per week to meet requirements, the equivalent of a 140-car train. It is shipped to the plant from nearby coal fields, either by rail or boat. As a precautionary measure, the boilers can be converted to fuel oil consumption on short notice should anything happen to the coal supply or to the pulverizing equipment. However, only a small amount of fuel oil is kept on hand, as it is purely a stand-by arrangement.

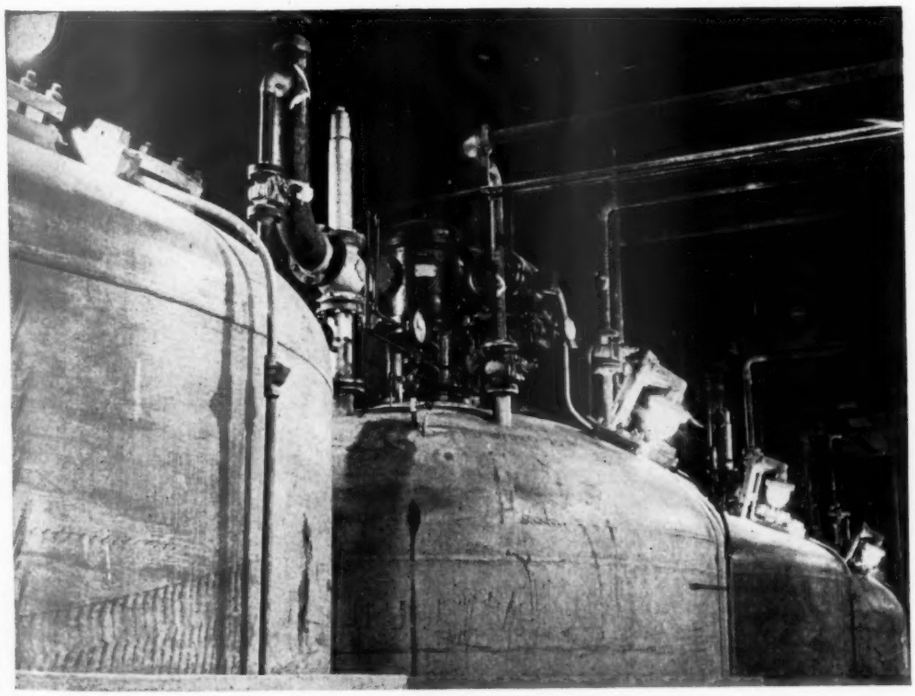
Much of the steam not used for processing is condensed and returned to the boilers. It is usually not economically practicable to purify process steam which has been contaminated by chemicals. In this case savings are made on treating chemicals and condensing non-process steam reduces the load on the water plant.

Water Requirements Big

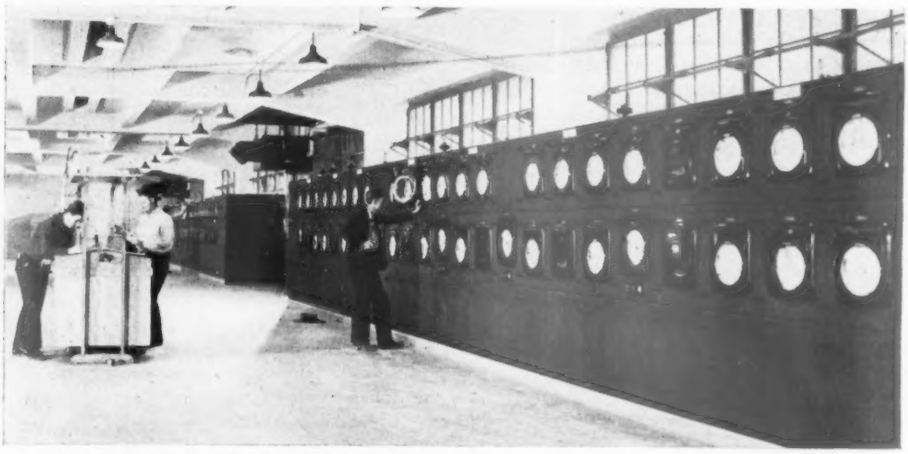
There are 2 water intakes drawing water from a nearby river, both identical in design. Combined the 2 intakes can supply 120,000 gal. of water per minute, enough for the needs of a city the size of Los Angeles. Also, from this supply, 2000 gal. per minute of treated water, zeolite softened and clarified by the action of soda-ash and alum, is furnished to the steam power plant and certain other areas where such purified water is required. Since there is no attempt at bacterial control, the water is not used for human consumption. Water for human consumption is supplied from the Charleston mains.

The 2 pump stations each contain 6 electrically-driven, centrifugal pumps rated at 11,000 gal. per minute. Also each station has 2 fire pumps of 1100 gal. per min. each, one steam driven and the other electrically driven. In case of a fire alarm from any one of the hundreds of alarm boxes scattered over the plant, the electric pump turns on automatically. The steam pump must be started and cut into the main manually. It is used as a standby in case of electric power failure.

Both pump houses supply a centrally-located water-treating house. Here, the foreign material is removed from the raw river water by means of soda-ash and alum. Water for special process use and for boiler water make-up, amounting in all to 2000 gal. per minute maximum, is



A few of the 72 reactors for the polymerization of butadiene and styrene into Buna S rubber. Motors on top are to drive the agitators. The vessels are glass lined, the materials agitated for 14 hours before going to the next operation



Automatic recorder-controllers for process control of two of the butadiene units

zeolite softened in addition to the clarifying step.

Most of the water supplied is used for cooling in the production of butadiene and styrene, and also in the copolymer plant itself.

Electrical Utilities Described

The electrical utilities, as stated previously, consist simply of a central distributing station; no power is generated at the plant site. Electricity, at 132,000 volts A. C., is stepped down by transformers to 13,200 volts and so supplied to all units and buildings alike. At these sub-points, it is further reduced to whatever voltages are required in the individual application, to as low as 110 volts for lights and even lower where required for special services. Synchronous motors are used wherever possible, resulting in a power factor for the whole plant which ranges from 0.95 lead to 0.98 lag. This, of course, reacts favorably on the electric bill, since no low-power factor penalty is incurred.

Two control laboratories are maintained in the plant, one for butadiene-styrene manufacture and the other for copolymer manufacture. The functions of each are specialized according to the units they serve. More than 1800 samples of various kinds are taken and analyzed daily to assure uniformity of products. In water plant, rubber plant and butadiene and styrene units samples also are examined by the operators, but this is merely as an aid to control and not intended to supplant searching laboratory inspection of all steps during manufacturing. Much of the routine work in the laboratories is done by women chemists, generally those who have had some college chemistry but are not graduates. Supervision is in the hands of trained male chemists and chemical engineers. No research facilities are maintained, this being done in the laboratories of the operating companies, and coordinated with the activities of others in the industry by the Office of the Rubber Director.

Few Engineers Among Personnel

Supervisory personnel of the plant is for the most part trained men who received their skill by years of experience in chemical plants and rubber factories. They never had worked in a synthetic rubber plant before, but the mode of operation is quite similar to that used in general chemical manufacturing. Supervision is in the hands of technically trained men, who number less than 15% of the total plant personnel. Currently, it is reported no critical manpower difficulties exist.

Properties of Synthetics

In a short talk at the close of a recent formal inspection of the Institute properties, the assistant copolymer factory manager, Ludwig Meuser, of U. S. Rubber Co. brought out the following interesting points on synthetic rubber and its manufacture:

A butyl rubber inner tube will hold air twice as well as a natural rubber inner tube, but butyl rubber is not as satisfactory for many purposes as natural rubber or Buna S synthetic.

"GRS" rubber (government rubber, styrene base—or Buna S) is not of satisfactory strength without 50 parts of channel black blended into it, in addition to other components. But these blacks impart the property of developing internal heat in a tire, and although this is not so serious in a passenger-car type tire because of its relatively thin walls, it is very serious in large airplane and truck tires. The trouble lies largely in the fact that cords made from cotton are swiftly weakened when heated. To get around this trouble, rayon cord has been substituted, since it has the property of developing greater tensile strength after being heated. Nylon cord is said to be even better in this respect. Consequently, development of greater tensile strength in rayon and nylon permits lighter tire construction, which in turn results in greater heat dissipation and has the effect of less temperature elevation in the tire. Metal threads are being considered instead of synthetic silk or cotton but this, naturally, is "out for the duration." Rayon was used in large truck and bus tires before the war.

'GRS' Good at High Speed

"GRS" will out-perform natural rubber at high speeds. This especially fits it for fabrication into airplane-type tires which are subject to high landing speeds and considerable scuffing.

"We have made as much progress in 30 months with synthetic rubber as we have in 30 years with natural rubber," Mr. Meuser declared. "Commercial production of synthetic rubber is a permanent industry, but to compete with natural rubber in an open economy, our products must be improved. A sure way to kill any business is to throttle its research program."

In this connection, other officials of the plant told the writer that the need is for more and more research. An appropriation of $10,000,000 annually for research on synthetic rubber would pay inestimable dividends to the United Nations during the war, and to this nation afterwards, they maintained.

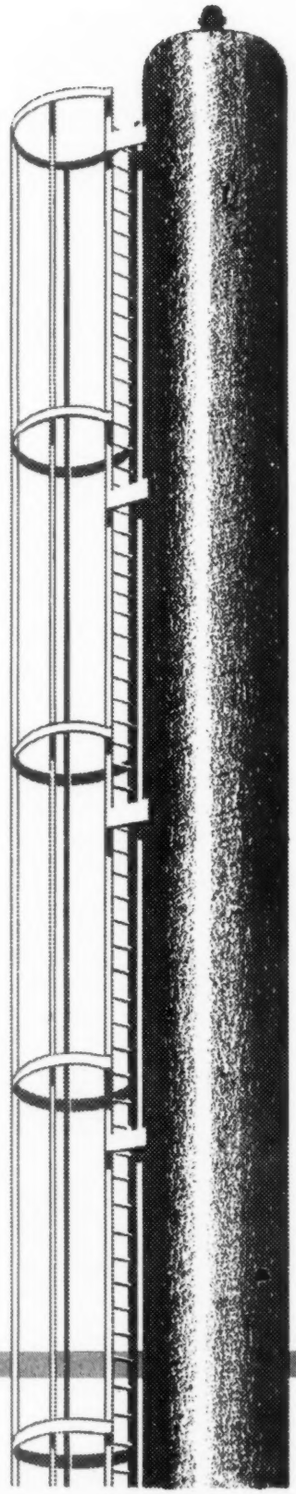
After the war, in all likelihood the raw materials for synthetic rubber—alcohol (or butadiene itself), benzene and ethylene—will be made from petroleum rather than from agricultural sources, Mr. Meuser stated.

Comparative Properties of Synthetic and Natural Rubbers*

Properties Important in Processing:	NATURAL RUBBER	BUNA S TYPE	BUNA N TYPES	NEOPRENE TYPES	BUTYL TYPE	THIOKOL POLYSULFIDE TYPES
Form in which available:	Latex and Solid Forms	Latex and Solid Forms	Latex and Solid Forms	Latex and Solid Forms	Solid Form	Dispersion, Solid & P'wd'r Forms
Breakdown	Very Good	Good	Fair	Good—V.G.	None	Slow
Plasticity Range after Breakdown	High-Low	High-Low	High-Medium	High-Low	Medium	High-Low
Building Tack and Cohesion	Excellent	Fair	Fair	Very Good	Good	Fair-Good
Vulcanizability	Very Good	Very Good	Very Good	Very Good	Fair-Good	Fair
General Processibility	Very Good	Good	Fair	Good	Fair	Fair
PROPERTIES IMPORTANT IN APPLICATION						
Physical Properties						
Extensibility	Excellent	Good	Good	Excellent	Excellent	Good
Resilience	Excellent	Good	Fair-Good	Very Good	Low	Good
Tensile	Excellent	Fair-Good	Good	Very Good	Good	Fair
Electrical Properties	Excellent	Excellent	Fair	Fair	Excellent	Fair
Impermeability to Gases	Good	Good	Good	Very Good	Excellent	Excellent
Impermeability to Water	Good-Very Good	Fair-Good	Fair-Good	Fair-Good	Very Good	Very Good
Resistance to:						
Plastic Flow	Very Good	Good	Good	Good	Fair-Good	Low
Abrasion	Very Good	Good-Very Good	Good-Very Good	Very Good	Fair	Low
Tear	Very Good	Fair-Good	Fair-Good	Good	Fair-V.G.	Fair-Good
Heat	Good	Fair-Very Good	Fair-Very Good	Very Good	Fair	Low
Cold	Very Good	Very Good	Fair-Good	Fair-V.G.	Good	Fair-Good
Chemical Properties						
Resistance to:						
Air	Fair	Good	Good	Excellent	Excellent	Excellent
Ozone	Inadequate	Inadequate	Fair	Excellent	Excellent	Excellent
Light	Fair	Fair	Low	Excellent	Excellent	Excellent
Petroleum	Low	Low	Excellent	Good	Low	Excellent
Aromatic Oils	Inadequate	Inadequate	Fair	Low	Inadequate	Excellent

Note: This chart covers only generalized types of synthetic rubber. The information given should not be used in specifying materials. Individual properties may be developed by special compounding, as suggested by the ranges shown in the table. Definite recommendations as to type should be left to the manufacturer. Table compiled March 1943.

*From "The Five Commercial Types of Synthetic Rubber", published by United States Rubber Co., (1943), p.11.



Chemical Grade* HYDROCARBONS

Normal Butane • Iso-Butane • Propane • Iso-Pentane

That Warren Petroleum Corporation pioneered the production and marketing of Liquefied Petroleum Gases is a matter of growing historical significance. From the inception of the Liquefied Petroleum Gas Industry, when the bulk of all its products were used only as fuel for heat and power, WARREN recognized their potential value—established a specialized service to both producers and users of Butane and Propane—built and operated numerous plants.

Warren has produced large quantities of high purity Normal Butane, Iso-Butane and Propane to meet the exacting wartime chemical and refining requirements.

Now Warren has pioneered another major development in this important field—the introduction of a new designation for its high purity light fractions:

Chemical Grade* HYDROCARBONS

Warren has designated these more rigid standards and specifications for these materials used in refining lubricating oils, for the manufacture of 100-Octane Aviation Gasoline, Butadiene and Styrene for the synthetic rubber industry and for many plastics and chemical products.

Don't confuse Warren's Chemical Grade "family"—Normal Butane, Iso-Butane and Propane—with ordinary Liquefied Petroleum Gases for fuel purposes. The rigid uniformity and exacting specifications of these Chemical Grade products set them apart for specific uses in a new and growing Petrochemical Industry.

* *Copyright 1943, Warren Petroleum Corporation*

WARREN
PETROLEUM CORPORATION
Tulsa, Oklahoma
Manufacturers, Exporters and Marketers of
Natural Gasoline, Liquefied Petroleum Gas
and Chemical Grade* Hydrocarbons

Export Terminals: Corpus Christi, Port Arthur and Norsworthy, Houston, Texas, Lake Charles, La., and Marcus Hook, Pa

Safe Handling of AHF*

Precautions to be Observed in Design and Operation of Plants Using Anhydrous Hydrofluoric Acid, the New Refining Chemical

The use of hydrogen fluoride as a catalyst for the production of aviation gasoline is introducing in petroleum refining a potentially hazardous chemical which requires special consideration in the design, construction and operation of plants. While new in petroleum refining, experience in safe handling of hydrogen fluoride in the chemical industry is of many years' standing. An authority in this field discusses accepted practice in the selection of materials for plants and equipment, for shipping and storage containers and safety practices for operators.

By Charles M. Fehr**

ALTHOUGH hydrogen fluoride was discovered in 1768 by Margraff, it was not available for commercial use in its anhydrous form until 1931, being used before that time in aqueous solution of strengths varying from 30% to 60% HF by weight. Its manufacture in the U. S. may be placed prior to 1876, through an old bill of sale dated April 10, 1876, transferring certain materials, including "fluoric" acid.

Little was it realized that "fluoric" acid as it was known then, would be manufactured some day in the U. S. in figures exceeding millions of pounds yearly as anhydrous HF, rather than the small volumes of weak acid available in that day. In 1931 and the year following the Easton, Pa., works, now owned and operated by the Pennsylvania Salt Manufacturing Co., produced and shipped nearly 500 tons of anhydrous HF in tank cars and in tank trucks to a nearby customer for a special organic operation. Recently the use of AHF has expanded rapidly, especially in the oil refining industry, and it is now produced at:

General Chemical Co., Claymont, Del.; Kinetic Chemical Co., Wilmington, Del., and Pennsylvania Salt Mfg. Co., Easton, Pa., in the East; Harshaw Chemical Co., Cleveland, in the Mid-West; Nyatex Chemical Co., Houston, in the Gulf area.

In addition, a new plant is being erected by General Chemical Co. on the Pacific Coast, at El Segunda, Calif., and Pennsylvania Salt Mfg. Co. and the Ozark Chemical Co. are jointly erecting a plant at Tulsa.

Before considering its various properties it is well to point out that at 98% or higher, AHF is an entirely different compound as compared with the weaker forms previously used in commerce. As it increases in strength changes take place in gravity, boiling point, freezing point and most important of all, its attack on materials of construction. The gravity rises to a maximum of approximately 1.259 at 80% strength and then drops off as the strength increases. Between 65 and 80% the corrosive characteristics of HF change. For example, below 65% it has a low corrosion rate on lead, while above 65% to 70% it attacks lead rapidly. Again, below 60% it has a high corrosion rate on steel, while above 80% practically no action occurs on steel of good composition. Similarly, rubber, Neoprene and many synthetic plastics show excellent resistance to weak HF but are increasingly attacked in strengths above 60% and 80%.

As we are concerned here only with AHF as it is received and used in the refinery, and not in the alkylation process itself, it will be well to remember that we are dealing with AHF and that its problems are peculiar and different from the problems involved with the lower strengths. It may be regarded as on the borderline between a true compressed gas and a corrosive liquid. As most of the experience of equipment manufacturers has to date been concerned with the handling of HF below 60%, many of the exasperating corrosion problems previously experienced will be eliminated with this form of HF.

Principal Properties and Their Relation to Use

Certain properties have direct relationship to the problem of handling and are briefly outlined:

Freezing Point; Approximately —117.4° F. This unusually low value assures that it may be stored and used in process at very low temperatures without the problem of solidification. For example, 66° baume sulphuric acid (93.19% H_2SO_4) freezes at —29° F. Likewise, 98% H_2SO_4 freezes at +36° F.

Boiling Point, approximately 66.9° F. at atmospheric pressure. This is ideal, assuring ease of handling either as a liquid or a gas.

Vapor Pressure, which is about 17 lbs. per sq. in. gauge at 100° F. assures storage in medium pressure vessels and its retention as a liquid at elevated temperatures without objectionable pressures.

Low Viscosity and Surface Tension causes the acid to flow easily in comparatively small pipes. Less equipment is required and less time is consumed in transferring.

Heat of Reaction with water is approximately 11,500 cal. per formula weight. Less heat of reaction will be evolved than with other alkylation catalysts and temperature control should be simplified.

Heat of Vaporization is about 6000 cal. per formula weight, assuring its removal from reaction products by application of a small quantity of heat.

Satisfactory Materials Of Construction

In our first work on the production of AHF in 1931, laboratory and pilot plant tests were conducted to determine roughly which materials were satisfactory or unsatisfactory. While these tests were helpful in the development of an entirely new process they did not tell the complete story. It was only after the

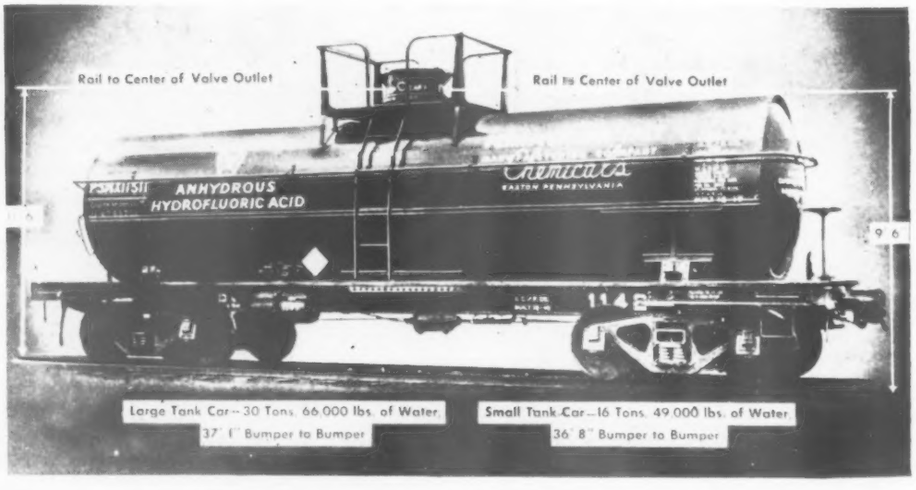

Rail to Center of Valve Outlet
Rail to Center of Valve Outlet
ANHYDROUS
HYDROFLUORIC ACID
Chemicals
EASTON PENNSYLVANIA
1148
Large Tank Car—30 Tons, 66,000 lbs. of Water
37' 1" Bumper to Bumper
Small Tank Car—16 Tons, 49,000 lbs. of Water
36' 8" Bumper to Bumper

Fig. 1—Anhydrous hydrofluoric acid tank car with safety platform

*Presented before Technical Group Meeting, Western Petroleum Refiners Assn., Tulsa, July 9, 1943.

**Chemist, Pennsylvania Salt Manufacturing Co. and Technical Advisor to Ozark Chemical Co.

process was actually in full-scale operation that real progress was made in determining desirable materials of construction. We found that, because of its low corrosion rate, mild carbon steel was excellent for handling AHF and was the logical material for storage tanks, pipes, fittings, valves, and pumps. This conclusion has been sustained by experience during the past 12 years and today it may be positively stated that steel tanks for storing AHF have been in service for 10 years and are in good condition today.

The shipping container problem has been solved by the use of steel. Apparently a protective coating forms on the surface of the steel inhibiting further corrosion. This becomes a problem on valves in that it will cause valves to freeze unless operated at fairly frequent intervals. This is probably because the film cements moving parts together. By opening and closing valves at least twice each shift this operating difficulty may be avoided. Obviously, double-valving is required.

Some steel is more resistant to AHF than others. A thoroughly deoxidized, dead melted, or killed steel in which the non-metallic inclusions are absolutely at a minimum is the ideal steel. Bessemer steel is not desirable due to lack of precise control.

Our experience with Monel has been satisfactory and it appears the best of all commercial available non-ferrous metals for AHF. However, with the present restrictions on the use of nickel alloys, steel is preferable wherever possible. For the fabrication of laboratory equipment for handling AHF, such as sample bottles, valve parts, especially valve stems, and for parts in contact with weaker acid, Monel metal is ideal and should be used.

Copper has been found satisfactory in various parts of the process. Under proper conditions it is a close second to Monel. It is, however, attacked in the presence of sulphur dioxide and oxygen and, where these are present in the AHF, copper is unsatisfactory. We recently examined a copper coil, put into operation in 1931 for two years and recently returned to service, finding it in an excellent state today. Copper tubing is excellent especially where flexible connections are needed.

In addition to these metals, silver and platinum may be employed where construction justifies. Platinum is probably the most resistant of all metals to AHF and silver has very excellent resistance in the absence of sulphides or appreciable quantities of sulphuric acid.

Readers are cautioned to interpret these recommendations as applying to AHF, only, since steel is not satisfactory for HF below 60%. Copper, Monel, silver and platinum are resistant to the weaker acids except under the specific adverse conditions noted in the foregoing. Platinum and silver are particularly useful for small parts or for special members such as frangible discs.

Unsatisfactory Materials Of Construction

Among the unsatisfactory materials of construction, probably the most readily attacked are those containing silica, such as glass, porcelain, enamelware, asbestos, certain silica cast irons, etc.

While lead is serviceable for acids below 65%, under normal conditions it is unsatisfactory for strong acids, especially AHF.

Cast iron is more resistant to AHF than lead but, probably due to silica inclusions, it is not a generally satisfactory material. Cast iron fittings will last only a comparatively short time before replacement.

Among other materials found unsuitable for AHF are wood, which chars instantly; rubber, which polymerizes and hardens, and most plastics. We have hopes, however, of a non-flexible plastic which is now being studied as a desirable material.

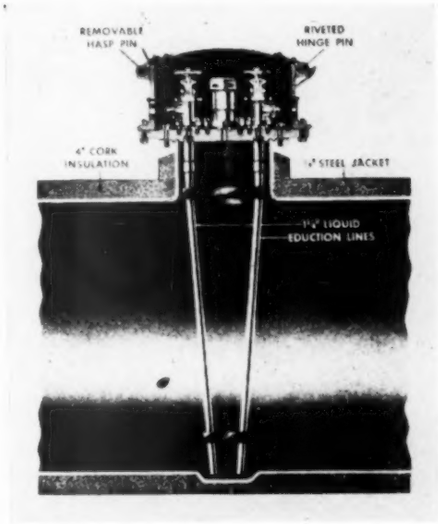


Fig. 2—Cross section of tank car dome and inner shell

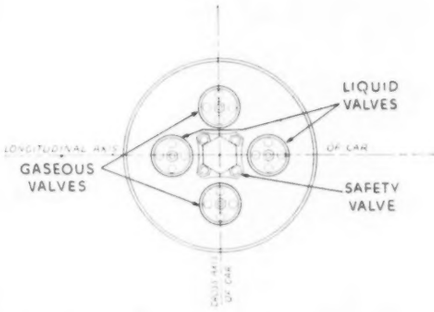


Fig. 3—Sketch of top view of dome showing valve arrangement

Shipping Containers

AHF is regulated by the Interstate Commerce Commission as a hazardous article, being classified as one of the strengths of hydrofluoric acid. Strictly interpreted it is not a compressed gas although its shipping containers are compressed gas pressure vessels. A compressed gas is defined in ICC regulations as being any material with a pressure at 70° F. exceeding 25 lbs. per sq. in. gauge. AHF is only ½ lb. gauge pressure at 70° F. Its permitted shipping packages are:

Cylinders: ICC Spec. 3, 3A, 3B, 3C, 3E, 25 (all seamless steel cylinders of various types); 4, 4A, 4B, 4C, 38 (forge welded but not brazed cylinders of various types). Cylinders are filled to 85% of their water capacity, which means that a cylinder holding 100 lbs. of water brimming full can be loaded with not more than 85 lbs. AHF. We favor cylinders holding 235 lbs. net, weighing 428 lbs. gross.

Single Unit Tank Cars: Forge welded pressure vessels mounted on a running gear and forming a part of a complete tank car, specifically ICC Spec. 105A-500, better known to your industry as the ammonia, chlorine or propane car.

Shipping Container Valves: All-steel or brass valves are in service. The all-steel ammonia cylinder valve has been specially adapted to AHF service by replacing tin seat with copper and the provision of suitable packing. AHF cylinder valves are not fused. Valve outlet nipple openings are ⅜-in. American National Standard female taper pipe threads.

Like the chlorine and ammonia tank car domes, the AHF car is fitted with two gas valves on the cross axis and two liquid eduction valves on the longitudinal axis of the car. A specially fitted safety valve provided with a platinum protected frangible disc is centered between the four valves and set to be gas tight at pressures below 180 lbs. per sq. in. and wide open at 225 lbs. per sq. in. gauge. The outlet nipple opening connections of the two gas and the two liquid eduction valves are 1-in. American National Standard taper female pipe threads.

These cars are insulated and may be filled to 90% of their water capacity. Cars available from our works hold 11.6 tons and 21.6 tons respectively.

Storage Vessels

Steel tanks are the logical storage vessels for AHF and should be of welded construction conforming to Par. U-68 of the A.S.M.E. code for unfired pressure vessels. Proper outage must be provided and insulated storage tanks should not be loaded to more than 90% of their water capacity—non-insulated tanks to 85%. Where feasible, scale mounted tanks are more preferable than level indicators because of minimum error and trouble. Bottom outlets on storage tanks should be avoided wherever possible by loading and unloading through a stand-pipe. When bottom outlets on storage tanks are unavoidable a drop plug valve should be provided as protection in case of valve failure. Storage vessels must be provided with a safety valve set to open at two-thirds of the working pressure of the tank and protected by frangible platinum discs.

Transfer Of Acid

The transfer of AHF is a major problem which may be accomplished in two ways—by pressure padding with dry air or an inert gas, such as butane, or by pumping.

Pressure padding is indicated for the transfer of a volatile liquid such as AHF from tank cars and storage tanks equipped with well pipes. Pressure on the receiving tank must be depressed by occasional venting of gas from the top of the tank. In the manufacturing plant this gas is recovered in the absorbing system

but in the refinery should be absorbed in an alkaline scrubber. The chief advantage of pressure padding is the elimination of pumps and bottom outlets on storage tanks. The packing problem on acid pumps is serious where strict acid specifications preclude the use of a special liquid hydrocarbon pressure seal packing gland.

The alternate method of transfer is by means of centrifugal or positive displacement type pumps. For satisfactory operation these should be fed from a bottom outlet in a tank in order to avoid vapor lock. Packing problems on centrifugal pumps used in the refinery are minimized by specially designed liquid hydrocarbon pressure sealed glands.

Flowmeters and weigh tanks are both used for the measurement of acid to process.

Piping

Extra heavy seamless steel pipe and forged steel fittings are preferable for handling AHF. Welding makes the ideal joint, provided the weld is homogeneous and free of slag and oxides. Welded fittings should be used wherever possible. If threaded joints are used on small pipe, the threads should be carefully cut, pulled up tight and seal welded. Some designers do not seal weld pipe under ½ in. size, reporting threaded joints satisfactory.

For connecting pipe larger than 2 in., ring flanges with soft iron or copper gaskets are satisfactory. Neoprene or Vistanex impregnated asbestos gaskets have been successful especially on small lines.

Heavy copper tubing is satisfactory for flexible connections to scale mounted tanks.

Valves

Needle, globe and gate valves have been used successfully. Whenever application permits we prefer a needle or globe valve due to its sturdy construction. Steel is an excellent construction material and valves may be machined from bar stock or forged. Cast steel valves if used must be carefully examined for porosity and sand holes. Deep stuffing boxes and outside screw and yolk are desirable. The principal difficulty with all steel valves is freezing of the seats and corroded stems. Regular operation of the valve reduces freezing and Monel trim valves, especially stems, are an excellent freezing preventive. Corroded stems may be avoided by keeping the packing glands tight.

Our experience with lubricated cocks in AHF service has not been satisfactory, due to an unsatisfactory lubricant. We understand that improvements in design and lubricants have eliminated the difficulty. The principal advantage of lubricated cocks is the elimination of packing problems.

Pumps

Cast steel centrifugal pumps with steel impellers have given good service with the exception of packing difficulties. Packing problems on this pump have been greatly reduced by the use of liquid hydrocarbon pressure seal glands, but this application is not always permissible due to acid contamination.

Small positive displacement type pumps constructed of steel, Monel or special bronze have given good service. They are inexpensive, and we have found them more trouble-free for our operations than the centrifugal pump.

Packing

Obtaining suitable packing for pumps and valves and sheet packing for flanges is one of the most difficult problems encountered in handling AHF. However, packing manufacturers are developing improved packings and this difficulty is apparently being solved.

The ideal pump packing should be resistant to acid, have compressibility and should not score the shaft. The shaft should be highly polished smooth finish, or with Monel sleeve. Resistance to the acid is obtained by use of copper or aluminum foil, or copper metallic braid. Compressibility is obtained by the use of heavily graphited and lubricated asbestos, Neoprene or Koroseal cores, which have been moderately successful. Anchor Packing #858, having a braided copper covering with a heavily graphited asbestos center, has been used with reasonable success for packing pumps and valves. We understand that a copper foil packing, with some of the rings containing a Neoprene or Koroseal core, is satisfactory for both valves and pumps. It is to be expected that pumps and valves packed with the best available materials will require regular inspection and removal of packing at intervals. Packing deteriorates at a higher rate on idle pumps and packing life can be conserved by starting up the pumps several times each shift. On larger valves with deep packing glands lubrication supplied through a lantern in the center of the gland is desirable to prolong the life of the packing.

Neoprene or Vistanex impregnated asbestos sheet has been successful for flange packing. We would not expect a flange joint gasket of this kind to be as satisfactory as metal gaskets. Tygon seems to show promise in preliminary tests and may prove superior to impregnated asbestos sheet.

Recommendations On Construction

Welded joints are ideal for AHF and welding should be used wherever possible in the construction and erection of equipment,and should be used to seal threaded joints on small lines. Welds must be full, homogeneous and free of inclusions of slag and oxides. We have found a reverse polarity welding rod of the same composition as the material being welded desirable. Good welding requires good craftmanship and it is desirable to specify A.S.M.E. Class III minimum welders.

Avoid overhead lines and slope acid lines to storage or drain tanks wherever possible. If pockets in acid transfer lines are unavoidable, methods of draining must be provided.

It is best practice to install valves below eye level with the packing glands vertical. The use of double valves is often indicated, and, in the case of globe valves, it simplifies repacking. Valves and pumps should be readily accessible avoiding location in pits and areas congested with equipment. The repair of this equipment is not simple and may be greatly facilitated by proper placement. Open areas allow men to work on the windward side.

Wire for motors should be run in conduit and connections to motors made in flexible metal conduit.

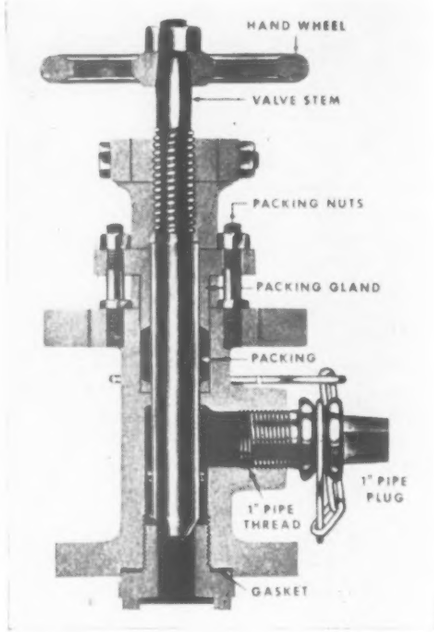


Fig. 4—Cross section of tank car valve

Glass is very readily attacked by HF fumes and will cloud up very quickly. Although plastic (polystyrene) is not perfectly resistant to HF over a period of time, it is superior to glass and is satisfactory as a substitute for glass in gauges and instruments.

After construction has been completed all lines should be pressure tested for leaks before operation begins.

Safety Practices

As the safe handling of AHF is essential to successful plant operation a study of safety practices is well worth consideration. Our experiences clearly indicate that it can be handled safely. The refining industry, long accustomed to handling hazardous materials, should solve its AHF safety problems without undue difficulty.

Although safe handling of any dangerous chemical is largely the function of materials of construction and design, the human element also plays an important part. The selection of personnel should be based on ability to follow orders and obey safety instructions. The men should think straight and act quickly in cases of emergency. They should respect the material they are to handle, but they must not be afraid of it. A man who is afraid of his work is a liability and should be transferred; otherwise he may some day be responsible for injury to himself or others. It should be clearly recognized that certain men are unsuited for work with AHF, due to the fact that even slight concentrations of fumes will cause severe nasal and throat irritation.

People who sunburn readily usually burn easily from fumes of AHF and when working where these fumes are apt to be encountered should wear proper protective clothing. Our operators have found that zinc oxide powder applied to exposed skin surfaces minimizes the danger of burning. A special HF oint-

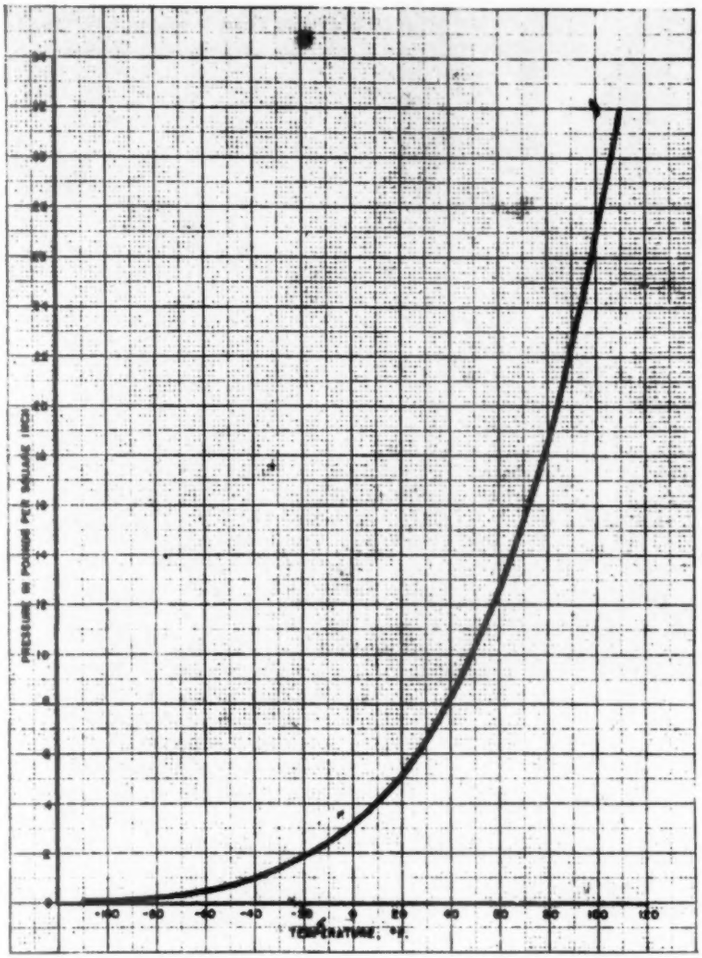


Fig. 5—Vapor pressure-temperature curve for hydrogen fluoride

ment containing magnesium oxide may also be used for this purpose.

In the safe handling of AHF, periodic inspection of premises and equipment, including tools and safety appliances is imperative. Regular inspection of acid lines, valves, pumps and equipment will detect leaks at their beginning, spot potential trouble and avoid costly repairs and injury. It is wise to make sure that tools and safety equipment used by the men are in good order and adequate. Repairmen should be thoroughly familiar with the AHF equipment in use and with methods of repairing it. They should also be familiar with the required use of safety equipment for each job. These men must be reliable and must adhere to prescribed safety rules. Remember always that the safe handling of any dangerous chemical depends upon keeping it confined and off the skin, and all safety practices should be devised with these goals in mind.

All equipment scheduled for repair should be considered full of acid until it has been definitely established as empty. Tanks, pumps, lines and valves that are to be repaired should first be drained, flushed and evacuated. Workmen should never be allowed to attempt repair of equipment while pumps are in operation and the lines full of acid. If pipe sections are to be removed and flanges opened, the lower bolts should be loosened first and, although the lines may have been flushed, care should be taken to avoid any drip. Graphite on threads facilitates removal.

Employees should be instructed never to stand in front of an open acid line or in front of a valve while it is being opened.

If it is necessary to remove sections of lines by cutting with a torch, be doubly sure that the lines have been drained, flushed and evacuated before starting work. Operators engaged in this type of repair work where spatter is possible should wear full protective clothing. The hazard of hydrogen explosion is prevalent when cutting into empty acid lines or empty acid tanks, especially if they contained weak acid. This hazard can be minimized by adding dry ice to the receptacle or line before starting repair work.

Equipment, such as valves, motors or fittings, removed from acid service should be identified with a distinctive marking and thoroughly washed with an alkaline solution before being handled. All workmen should know the meaning of this marking and should never touch articles of this type with bare hands or without proper protective clothing.

(The section of this paper discussing preventive measures and first aid treatment for injuries from hydrofluoric acid burns is omitted. Editor)

YOUR GUIDE

To the New Petroleum Chemicals Industry

"ABC of Chemical Derivatives from Petroleum"

By R. L. Wakeman and B. H. Weil

In addition to complete text, illustrations and charts as published in 7 articles in the Technical Section of National Petroleum News, this series now presented in book form includes:

SELECTED READING LIST—Bibliography of over 100 listings chosen by the authors to give a broad reference list of books and journal articles on the new petroleum hydrocarbons compounds.

COMPLETE INDEX—Includes 640 items: Invaluable for reference on their chemical terms, formulae and other data.

"ABC of Chemical Derivatives from Petroleum" in article form aroused wide interest. It tells in layman's language the chemistry, processes of manufacture, and commercial fields of utilization of the new hydrocarbons which are vital materials in synthetic rubber, explosives and other wartime products and which in the future will be made in petroleum refineries as components of plastics, chemicals, soaps and many other new products.

Every oil company man who expects to have a part in making or selling the new petroleum chemicals will want to read this book. Every oil company will want a copy for its library.

Single Copies $1

Special prices for quantities on request. Fill out coupon below and mail now for immediate delivery.

8443

Platt's War-Oil Communication Services,
1213 West Third Street, Cleveland 13, Ohio

Ship me ..... copies "ABC of CHEMICAL DERIVATIVES from PETROLEUM" right away.

Check is attached for $.....

Name .....

Company .....

Address .....

City - State .....

Sheets of Buna N rubber in a Standard Oil Co. of Louisiana rubber plant

PROPERTIES of the Commercial Synthetic Rubbers

LATE data on the chemistry and physical properties of synthetic rubbers produced commercially in the U. S. and other countries has been compiled by the U. S. Bureau of Mines, as of May, 1943.° A condensed form of the compilation is given in the following pages for the convenience of readers who may desire to file it for reference purposes.

The information for the report was taken from the technical journals in various industrial fields in this and other countries, particularly the German and Russian journals outside this country. Reflecting the great interest of technologists in the subject of synthetic rubber and the intensive work in various countries to produce adequate supplies by economic methods to replace natural rubber, is the statement in the report that the journal literature on synthetic rubber comprises more than 1000 articles.

This latest listing of synthetic rubbers by the bureau is by the generally recognized classification by chemical types:

1—Butadiene polymers and copolymers, of which Buna rubbers are examples.

2—Substituted butadiene polymers. Includes chloroprene polymers (Neoprene), dimethyl butadiene polymers (Methyl rubber), isoprene polymers, this being the structure of natural rubber.

3—Butene polymers (Vistanex) and butene copolymers (Butyl rubber).

4—Organic polysulfides (Thiokols).

5—Plasticized vinyl chloride polymers (Koroseal).

The listing includes data on the chemical structure of the individual synthetic rubbers; status of their manufacture; method of synthesis; methods of vulcanizing and processing; and their physical properties. Detailed descriptions of actual polymerization operations for the most part are not available yet.

The desirability for a more definite system of nomenclature for the synthetic rubbers is indicated in the report, which refers to a system of classifications°° in which synthetic rubbers and rubberlike materials are called "elastomers" and the term "plastomer" is used for the true thermoplastic and thermosetting plastics. On this point the report says:

"Elastomers are further divided into elastoprenes, elastolenes, elastothiomers, and elastoplastics. The elastoprenes include the butadiene and piperylene rubbers (no piperylene rubbers are manufactured commercially) and the substituted butadiene rubbers, including isoprene, dimethylbutadiene and haloprene.

"The elastolenes include the polymers of the isobutenes and the elastothiomers are the organic polysulfides, whereas the term 'elastoplastics' is applied to plastics with rubberlike properties, including plasticized vinyl chloride polymers. This nomenclature has not yet been generally accepted, as the term 'synthetic rubber' to describe all artificial rubberlike materials has already attained wide use."

The raw materials for the production of crude synthetic rubber and the sources from which they are being obtained are described in the following section of the Bureau of Mines report:

Butadiene ($H_2C{=}CH{-}CH{=}CH_2$)

"Butadiene from petroleum or petroleum products or gases may be obtained in several ways, among which are the following:

"1. Thermal cracking of petroleum fractions at a high temperature.

"2. Direct catalytic dehydrogenation of normal butane or of butanes and butenes produced by cracking.

"3. From acetylene formed by pyrolysis of natural gas.

"4. From alcohol manufactured from ethylene obtained as a byproduct in cracking petroleum or by dehydrogenation of ethane.

"In Germany, butadiene is made from coke and limestone in the following steps: Coke and lime → calcium carbide → acetylene → acetaldehyde → aldol → butylene glycol → butadiene. Butadiene may also be made from acetylene by conversion to vinylacetylene and hydrogenation to butadiene.

"Butadiene production from grain or vegetable products involves preliminary fermentation to obtain alcohol, which is converted to butadiene in one of several ways involving dehydration and dehydrogenation. In Russia, this is accomplished in one step by use of a special catalyst, whereas the process used in the U. S. has two steps and that used by the Germans has four steps.

"Butadiene can also be made from grain by a special fermentation process that produces butylene glycol, which is dehydrated to give butadiene.

Styrene ($C_6H_5CH{=}CH_2$)

"Styrene has been manufactured for some time for use in the plastics industry; hence, the principles involved in its production are well known. The most common method consists of catalytically dehydrogenating ethyl benzene produced from benzene and ethylene or ethyl alcohol. Styrene may also be produced by high-temperature cracking of petroleum, but subsequent separation is difficult.

Acrylonitrile ($H_2C{=}CHC{\equiv}N$)

"Acrylonitrile is made by treating ethylene with hypochlorous acid to give ethylene chlorohydrin, which reacts with sodium cyanide to give hydracrylic nitrile, from which acrylonitrile is obtained by dehydration.

Chloroprene ($H_2C{=}CH{-}CCl{=}CH_2$)

"Calcium carbide, made from lime and coke in a high-temperature electric furnace, gives acetylene when treated with water. Vinylacetylene, formed by polymerization of two molecules of acetylene, is treated with hydrochloric acid to give chloroprene.

Isoprene ($H_2C{=}CH{-}\overset{CH_3}{\overset{|}{C}}{=}CH_2$)

"Except for possible use in Butyl rubber as the diolefin to furnish the required unsaturation, production of isoprene has at present no significance in the synthetic-rubber industry.

"Isoprene is a product of destructive distillation of natural rubber, and is also formed synthetically in small amounts in petroleum cracking. Processes have been developed that

°U. S. Bureau of Mines Information Circular 7242, "Synthetic Rubber, Its Production from Petroleum, Coal and Other Minerals", by W. C. Holliman, assistant research chemist, Petroleum Experiment Station, Bartlesville, Okla.

°°Proposed by Dr. Harry L. Fisher, Director of Organic Research, U. S. Industrial Chemicals, Inc., and Air Reduction Co., Stamford, Conn., author of many patents in the field of rubber technology and the Edgar Marburg lecturer before the American Society for Testing Materials, 1941.

use coal tar, starch, turpentine, calcium carbide, or petroleum products as starting materials.

Dimethylbutadiene ($H_2C=C(CH_3)-C=CH_2$)

"Dimethylbutadiene is the basic material for methyl rubber and is now of historic interest only. It was made by the Germans during World War I from acetone obtained from calcium carbide.

Isobutylene ($H_2C=C(CH_3)-CH_3$)

"Isobutylene is the principal ingredient in the manufacture of Butyl rubber and also is an important material in the manufacture of high-octane gasoline. This hydrocarbon is present in large quantities in gases from refinery cracking operations, and it may be made by dehydrogenation of isobutane, which is obtained from natural gases or from isomerization of normal butane.

Alkali Polysulfides and Organic Dihalides

"The alkali polysulfides used in Thiokol and the like are made from sulfur and alkali. The organic dihalides are made by halogenation of organic products usually obtained from petroleum. For example, ethylene dichloride is made by chlorination of the olefin from cracked gas with chlorine obtained from salt.

Vinyl chloride ($H_2C=CHCl$)

"Vinyl chloride is produced commercially by any of three methods—(1) catalytic combination of acetylene and hydrogen chloride (2) chlorination of ethylene to ethylene dichloride and partial dehydrohalogenation by treatment with alcoholic caustic, or (3) by vapor-cracking ethylene dichloride."

The list of commercial synthetic rubbers described in the Bureau of Mines report is as follows:

Chemical Structure and Properties of Individual Rubbers

BUNA 85: Polymerized Butadiene

Structure: $[-CH_2-CH=CH-CH_2-]_x$.

Status of Manufacture: Date announced, 1935, according to first available reference. Manufacturer, I. G. Farbenindustrie, Germany. In 1940 Buna 85 was listed as being made only on a small scale for use in making hard rubber.

Method of Synthesis: Polymerization of butadiene in the presence of sodium metal.

Vulcanizing and Processing: Vulcanizing is the same as for natural rubber. In processing it is soft, plastic, and easily workable on regular rubber machinery.

Properties and Uses: Relatively low molecular weight; lower than natural rubber in tensile strength and elasticity; behaves like rubber in organic swelling agents; abrasion resistance about the same as natural rubber; electrical and aging properties better than natural rubber; and heat resistance equal or superior.

Especially adapted for manufacture of hard rubber because of its high thermal softening point and extraordinary chemical resistance of its hard-rubber vulcanizates, which, however, are more brittle than hard, natural rubber.

BUNA 115: Polymerized Butadiene

Structure: Same as Buna 85, except for higher molecular weight or degree of polymerization.

Status of Manufacture: Date announced 1935, manufacturer being I. G. Farbenindustrie, Germany. Not included in listing in 1940 of synthetic rubbers made by this concern.

Vulcanizing and Processing: Vulcanizing the same as for natural rubber; plastic and easily processed.

Properties and Uses: Properties generally similar to those of Buna 85, except that the difference in molecular weight alters them somewhat, as, for example, abrasion resistance is listed as slightly better than in natural rubber or Buna 85, although poorer than in Buna S or Buna N.

BUNA S: Copolymerized Butadiene and Styrene

Structure: $[(-CH_2-CH=CH-CH_2)_x-CH_2-CHC_6H_5]_x$.

Status of Manufacture: Date announced 1935. Manufactured by I. G. Farbenindustrie, Germany, Standard Oil Co. (N. J.) and other companies in this country operating under the Standard Oil Co. patents and under the direction of the War Production Board.

Made and used in large quantities in Germany since 1936 as a general substitute for rubber, particularly in tires. Standard Oil Co. and Firestone Tire & Rubber have been manufacturing it in this country, although only 4000 long tons of Buna types were made in 1941. Under the government's rubber program an annual production of 705,000 tons of Buna S is planned for use in tires and as a substitute for natural rubber.

Method of Synthesis: Copolymerization in aqueous emulsion.

Vulcanizing and Processing: Vulcanizing is the same as for natural rubber and in processing it is plasticized by carefully controlled hot-air treatment.

Properties and Uses: In literature inspired by the German concern it is stated that Buna S constitutes an improvement on natural rubber in heat and abrasion resistance and it is claimed that tires made of it show 35% better wear than natural rubber tires.

In general, the properties of Buna S are very similar to those of natural rubber and its swelling characteristics in gasoline and mineral oil are but little better than those of natural rubber. Water absorption is only 65% of natural rubber and aging qualities are considered superior, these last named qualities making it useful for cable coverings.

BUNA SS: (formerly Levulkan): Copolymerized Butadiene and Styrene

Structure: Same as Buna S, except larger proportion of styrene.

Status of Manufacture: Date of first reference 1935. Made by I. G. Farbenindustrie, Germany.

Method of Synthesis: Same as Buna S.

Vulcanizing and Processing: Same as Buna S.

Properties and Uses: Differs from Buna S in proporton of styrene used, the difference in the properties being said to apply particularly to hard rubber linings. Buna SS is said to possess qualities making it especially favorable as insulation for cable.

PERBUNAN (formerly Buna N): Copolymerized Butadiene and Acrylonitrile

Structure: $[-(CH_2-CH=CH-CH_2)_x-CH_2-CHC\equiv N-]_x$.

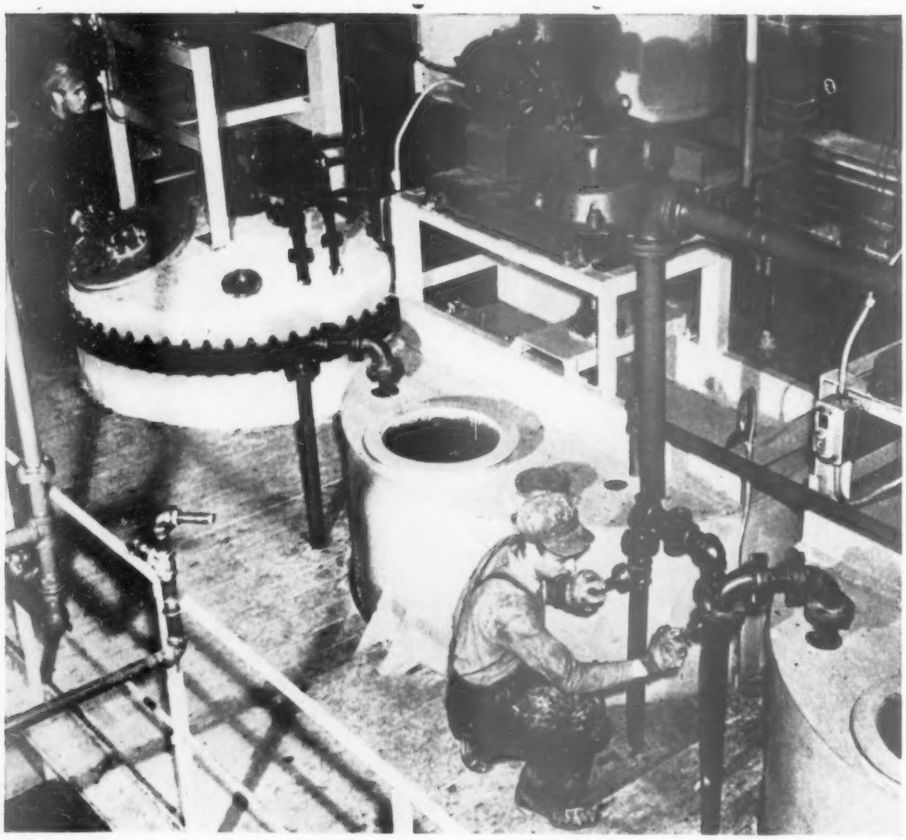
Status of Manufacture: First made in Germany about 1935 by I. G. Farbenindustrie. Now made in this country by Standard Oil Co. (N. J.), Firestone Tire & Rubber Co., and other companies licensed by Standard, which holds the patent rights. Present production figures not available.

Method of Synthesis: Copolymerization of butadiene and acrylonitrile in aqueous emulsion.

Vulcanizing and Processing: Vulcanizing same as for natural rubber. In processing, it cannot be plasticized like Buna S with hot air and does not break down completely on long mastication. Softeners are necessary to increase elasticity, tack, and assist in extruding. Addition of up to 20% of natural rubber improves working qualities without noticeably changing swelling characteristics. Is much tougher and more difficult to process than natural rubber. It generates more heat in milling, is less thermoplastic, but has a tendency to harden at higher temperatures, and its plasticity is less pronounced during mastication than is natural rubber.

Properties and Uses: Primary property is its resistance to gasoline, petroleum, and aliphatic hydrocarbons. Soluble in aromatic and chlorinated hydrocarbons such as benzol, toluol, solvent naphtha, di- and trichlorethylene and in certain ketones. Aging qualities and resistance to ozone said to be superior to those of natural rubber but elasticity, rebound, and electrical properties poorer; because of the last named not being used as electrical insulation. In heat and abrasion resistance it surpasses natural rubber and is less than half as permeable to air and gases.

Finds greatest use where its oil-resistant qualities are needed, as in packing rings, gaskets, printing rolls, gasoline hose, hose for spraying paint,



The man in the background is at the tank where sodium polysulfide and organic chemicals are reacted to produce Thiokol, an organic polysulfide type of synthetic rubber. In the foreground are storage tanks. (Thiokol Corp.)

cable covers, conveyor belts. Although Perbunan tread compounds are said to be equal or superior to the best rubber tread compounds, its use in tires is not of commercial importance, as other synthetics easier to process and fabricate are considered more economically suitable.

PERBUNAN EXTRA: Copolymerized Butadiene and Acrylonitrile

Structure: Same as Perbunan, except that acrylonitrile content is greater.

Status of Manufacture: Made by I. G. Farbenindustrie, Standard Oil Co. (N. J.), Firestone Tire & Rubber Co., and other companies licensed by Standard. Date announced 1939. Present production figures not available.

Vulcanizing and Processing: Vulcanizing same as for natural rubber. Like Perbunan difficult to mill. However, Perbunan Extra is said to break down more readily and mill more easily than Perbunan.

Properties and Uses: More resistant to oil than Perbunan because of the extra acrylonitrile. General properties are like those of Perbunan, except that the vulcanizates are less elastic and higher tensile values are obtained without carbon black. Sp. gr. 0.97 and nitrogen content 9 to 10%.

SKA and SKB (Russian Sodium Divinyl Rubber): Butadiene Polymer

(The designations "A" and "B" refer to the source of the butadiene rather than to differences in the rubber produced.)

Structure: $[-CH_2-CH=CH-CH_2-]_x$.

(Similar to the German numbered Buna rubbers.)

Status of Manufacture: Made in Soviet Russia; manufacture of SK synthetic rubber using butadiene made from alcohol was started in 1931. Butadiene for SKA is obtained from petroleum and SKB from alcohol made from potatoes and other agricultural products. Principal production is from alcohol because of Russian economic conditions.

Production of more than 20,000 tons of SK synthetic rubber in 1935 was claimed and a planned production of 90,000 tons by the end of 1937 was said to be exceeded. Further expanded production was planned through 1942 but results of this program have not been disclosed.

Method of Synthesis: Previous to 1935, polymerization of liquid butadiene was effected under pressure at 50 deg. C. in enclosed vessels containing sodium-covered steel rods. A rodless method was introduced in 1935 in which the polymerization takes place in a gaseous instead of a liquid state.

Vulcanizing and Processing: Made in several grades by varying the conditions of polymerization. Some grades are easier processed than natural rubber. Mechanical properties of pure-gum stocks are developed, as with other synthetic rubbers, by compounding with fillers and vulcanization and compare favorably with Perbunan and Buna S.

Properties and Uses: SK is not oil- or solvent-resistant but resists oxidation to great extetnt. Said to be lacking in building tack, although several methods of overcoming this have been developed. Used in rubber footwear as well as in tires. In tires, it is said to give wear in actual road service only 15% less than similarly compounded tires of natural rubber.

KER: Butadiene Polymer

Listed in literature as made by Stomil Co. in Poland.

HYCAR O R (Americol): Butadiene Copolymer

Structure: Not announced. Said to be a copolymer of butadiene and acrylonitrile similar to Perbunan. Two types made.

Status of Manufacture: Date announced, 1940. Made by Hydrocarbon Chemical & Research Co. (Hycar Chemical); owned jointly by Phillips Petroleum Co. and B. F. Goodrich Co. Plant of 2000 long tons capacity constructed in 1940, present production figures not available.

Method of Synthesis: Polymerized under pressure in emulsion with soap and water. The butadiene is obtained from petroleum; source or nature of copolymer not announced.

Vulcanizing and Processing: Vulcanizing same as for natural rubber, except that less sulfur and more accelerator is required. Is tough and does not break down on a mill to the extent natural rubber does,

PIONEER PRODUCER OF

...the important new catalyst in the alkylation process

● Commercial quantities of anhydrous HF were first produced in the Penn Salt plant at Easton, Pa. (formerly the Sterling Products Co.). Consequently, we are able to put at your service the wide experience of our technical staff—to answer questions of handling or use.

The importance of the new catalytic alkylation process for the greater output of 100 octane gasoline cannot be overemphasized. The manufacture of high-power fuel *must* keep pace with the demands of a mightily expanding air force.

With this in mind, Penn Salt has greatly increased its facilities for supplying your needs for anhydrous HF. For complete information and engineering cooperation, write fully at once.

PENNSYLVANIA SALT
MANUFACTURING COMPANY
Chemicals

1000 WIDENER BUILDING, PHILADELPHIA 7

Branch Offices: New York • Chicago • St. Louis • Pittsburgh • Minneapolis • Wyandotte • Tacoma

CHEMISTRY IS THE KEYSTONE OF INDUSTRY

Properties of The Commercial Synthetic Rubbers

and more softener is required. Pigments have the same relative effect as with rubber.

Properties and Uses: Two distinct types of butadiene copolymer synthetic rubber are said to be made, both marketed under the name of Ameripol. One is a rubber suitable for tire manufacture and the other a special oil-resistant rubber.

Properties such as tensile strength and elasticity are said to vary over a wide range, according to method of compounding. Maximum tensile strength obtained with channel black loading. A tensile strength up to 4000 lbs. and 600% elongation may be obtained. Good heat and abrasion resistance claimed and superior resistance to mineral, animal, and vegetable oils and fats, to oxidizing effects of metallic soaps used as driers in paints and inks, to all petroleum products and to benzene, alcohol, water, and carbon tetrachloride, although badly swollen by acetone.

Aging resistance is superior to that of natural rubber and resistance to alkalies and acids about the same. Elasticity, tear resistance, and rebound lower than for similarly compounded natural rubber. Hardness may be varied over a wide range. Becomes stiffer than natural rubber at subfreezing temperatures but is said to be still flexible at —50 deg. C. Resistance to oxidation and decomposition when exposed to heat said to be excellent and permeability to air and gases less than natural rubber.

Oil-resistant products of Ameripol include gasoline hose, automobile and airplane parts, packing joints and valves, linings for bullet-proof gasoline tanks, printing rollers and the like. Tires are said to be slightly superior to tires made of natural rubber compounds in abrasive resistance and far superior in the presence of oils and high temperature.

CHEMIGUM: Butadiene Copolymer

Structure: Not announced but said to be a copolymer of butadiene and acrylonitrile similar to Perbunan.

Status of Manufacture: Announced in 1940 by Goodyear Tire & Rubber Co. It was then stated this synthetic rubber had been produced in laboratory and pilot plant for 3 years and that a new plant with initial capacity of 10,000 lbs. per day was being erected. No recent production figures available.

Method of Synthesis: Announced as derived from petroleum through a cracking process.

Vulcanizing and Processing: Vulcanizes the same as natural rubber. Said to process more easily than Buna on equipment and by methods used for natural rubber. Tends to be soft and plastic when warm and mixes well with natural rubber.

Properties and Uses: Specific gravity 1.06. A Buna-type product resembling in physical appearance grade of rubber known as brown crepe. Is tough and equal or superior to natural rubber in strength, and resistance to aging and sunlight. Much less soluble in conventional rubber solvents than natural rubber and its oil resistance makes it suitable for gasoline hose and similar uses. Tires made of Chemigum are said to give performance equal to or better than natural rubber tires.

NEOPRENE (formerly Duprene): Polymerized Chloroprene

Structure: $[—CH_2—C\ Cl=CH—CH_2—]_x$

Status of Manufacture: Date announced 1931. Made by E. I. du Pont de Nemours. In 1941, 6500 long tons were produced and annual rate of production of 60,000 tons was recommended by the Baruch committee.

Method of Synthesis: Polymerization of chloroprene in emulsion under carefully controlled conditions.

Vulcanizing and Processing: Vulcanized by heat alone, but quality of vulcanized products is improved by the use of metallic oxides as vulcanization aids. Processed like natural rubber.

Properties and Uses: The physical qualities of Neoprene, made in several types, may be modified over a wide range by the proper choice of pigments, accelerators, anti-oxidants, etc. The unvulcanized product is a plastic with considerable elasticity, like unvulcanized rubber. It is thermoplastic and formed, like rubber, by calendering, extruding and molding at high temperatures.

The vulcanized Neoprene is resistant to oils and, although virtually all animal, vegetable, or mineral oils cause it to swell somewhat, it usually retains its properties better than rubber. It is slightly less elastic than rubber but is more heat-resistant and resists sunlight better. Loss of properties on freezing is greater than with rubber unless oil-soaked or specially compounded. Type FR, introduced recently, is said to be exceptionally immune to the effect of subzero temperatures.

The specific heat (0.52) of Neoprene is the same as for rubber. It has approximately the same tensile strength as similarly compounded rubber. The abrasion resistance of tire treads is about equal to that of the best rubber tire tread compounds. Neoprene has about equal abrasion resistance to natural rubber when dry but is many times more resistant after having been soaked in oil.

Used for tank linings, reaction vessels, conveyor belts, gaskets, hose for oils, solvents and gases such as chlorine, clothing for acid protection, laboratory tubing and similar purposes.

SOVPRENE: Polymerized Chloroprene

Structure: Same as for Neoprene.

Status of Manufacture: Made in Russia. Successful production was reported in 1932.

Method of Synthesis: Sovprene is a polymer of chloroprene, the chloroprene being made by adding hydrogen chloride to monovinylacetylene produced from a continuous polymerization of acetylene, according to Russian literature.

Properties and Uses: In articles in which this product is discussed it is assumed to be generally like Neoprene.

MUSTONE: Polymerized Chloroprene

(Listed in the literature as a chloroprene polymer made by Umeno Institute of Japan.)

METHYL RUBBER: Substituted Butadiene Polymer

Structure: $[—CH_2—C\ CH_3=C\ CH_3—CH_2—]_x$

Status of Manufacture: In 1914-18, 2350 tons were produced in Germany by Bayer & Co. (H and W types); Badische Anilin und Soda Fabrik (B). Production discontinued at close of First World War because of cost of the product (30 marks a kilogram).

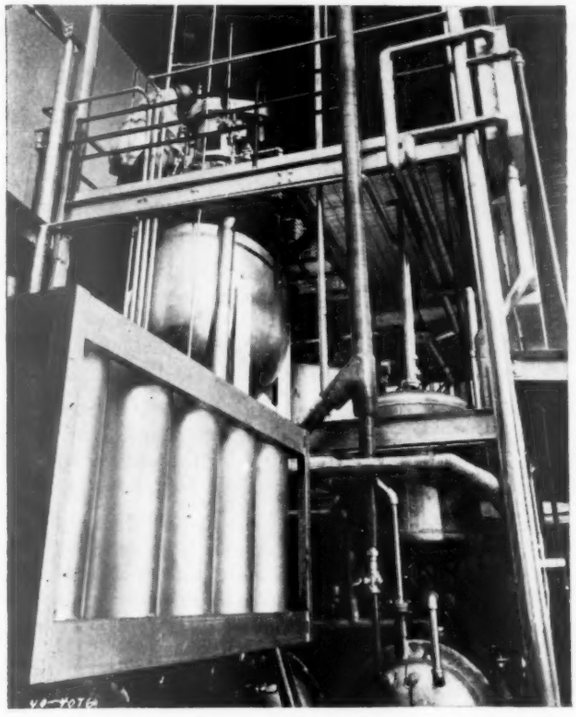
Method of Synthesis: Polymerization of 2, 3 dimethylbutadiene conducted at room temperature to give methyl rubber H or at a higher temperature to give methyl rubber W. Methyl rubber B was polymerized by means of metallic sodium in an atmosphere of carbon dioxide. The dimethylbutadiene was produced from acetone from calcium carbide.

Vulcanizing and Processing: Vulcanized like natural rubber, and methods of processing were similar to those used at that time for natural rubber, except that it was necessary to add swelling agents or elasticators to increase plasticity.

Properties and Uses: Methyl H was insoluble in rubber solvents and was used in the manufacture of hard rubber. It had low plasticity and poor adhesive qualities and was not easily milled. By 1918 it was used to some extent in manufacturing tires. This use was found unsatisfactory in that it was hard and inelastic at ordinary temperatures and flattened under pressure in cold weather. Lacking in wearing qualities also.

Methyl B was more suitable for wire insulation and more easily milled but did not give stronger vulcanized products. W was soluble in rubber solvents and used in high-pressure packing, other rubber-asbestos goods, balloon fabric, and as insulation for submarine cables.

Properties of The Commercial Synthetic Rubbers



In this 3-story network of cylinders, vessels and pipes, butadiene is emulsified with water and styrene to make Buna S synthetic crude rubber. (Firestone Tire & Rubber Co.)

VISTANEX: Polymerized Isobutylene

Structure: $[—CH_2—C(CH_3)_2—]_x$.

Status of Manufacture: Date announced, 1937. Made by Standard Oil Co. (N. J.) and Advance Solvents & Chemical Corp. Data not available on present production.

Method of Synthesis: Isobutylene derived from cracking of petroleum is polymerized at low temperatures with catalysts of an acidic nature, such as titanium tetrachloride, boron fluoride and aluminum chloride.

Vulcanizing and Processing: Cannot be vulcanized. Less thermoplastic and the degradation or breakdown by mechanical milling or mixing is less than for natural rubber. It may be compounded with natural rubber in certain proportions to give a curable product useful in steam hose, conveyor-belt covers, cable coverings and other products resistant to aging or chemical action.

Properties and Uses: Possesses unique qualities owing to its lack of unsaturation. Exhibits extreme resistance to ozone, acids, alkalies, and corrosive salts and has excellent aging properties, particularly at high temperatures. Its water-absorption and vapor-permeability properties are extremely low. Resistant to most vegetable and animal fats, oils and greases, and is insoluble in alcohols, esters, ketones, and most organic solvents containing oxygen; but is soluble in petroleum and coal-tar solvents and in some chlorinated solvents. Used in the manufacture of cable sheathing, acid-resistant linings, electrical insulation, adhesives, artificial leather, and like products.

OPPANOL: Polymerized Isobutylene

Structure: Same as Vistanex.

Status of Manufacture: Date announced, 1937. Made by I. G. Farbenindustrie, Germany. Developed by this company in cooperation with Standard Oil Co. (N. J.) and is the same as Vistanex.

BUTYL RUBBER: Copolymer of a Butene and a Diolefin

Structure: $[—CH_2—C(CH_3)_2—]_x—CH_2—CH=CH—CH_2—]_y$.

Status of Manufacture: Made by Standard Oil Co. (N. J.); date announced, 1940. Annual production of 132,000 tons planned under present program of War Production Board.

Method of Synthesis: Produced by low-temperature copolymerization of isobutylene and a small amount of butadiene or other diolefin, such as isoprene. The isobutylene is procured from petroleum by cracking, isoprene from petroleum or turpentine.

Vulcanizing and Processing: Vulcanizes like natural rubber. Processed like natural rubber on conventional rubber machinery. No breakdown period necessary. Curing temperature above 300 deg. F.

Properties and Uses: Butyl rubber regarded as outstanding in that it possesses only 1 or 2% of the available unsaturation of natural rubber, just enough for vulcanization. This quality gives it unusual properties in aging resistance and stability in the presence of ozone. Swells like natural rubber in petroleum and coal-tar solvents but does not swell in most vegetable and animal fats and oils. Resistant to acids, including sulfuric and nitric, has low water absorption, high heat resistance, excellent flex resistance, and is highly impermeable to air and gases, such as hydrogen, helium, and carbon dioxide. Its rebound is low at room temperature but high at high temperatures. The general range of molecular weight is 40,000 to 80,000 and specific gravity is 0.91.

Said to be satisfactory for inner tubes in that it holds air longer than natural rubber. Tires have shown a life about 50% of natural rubber tires at speeds under 40 miles per hour. Electric properties make it outstanding for cable insulation. Used also in fire and steam hose, molded goods, proofed goods, tank linings, conveyor belts, and in general replacement of natural rubber.

FLEXON: Copolymer of a Butene and a Diolefin

Structure: Similar to butyl rubber.

Status of Manufacture: Announced in 1942 by Standard Oil Co. (N. J.) as manufacturer. Still in experimental stage as of May, 1943.

Method of Synthesis: Produced by copolymerization of isobutylene and butadiene or other diolefin using dry ice in an open vessel, the raw materials and their sources being the same as for butyl rubber.

Vulcanizing and Processing: Same as for butyl rubber.

Properties and Uses: Flexon described as inferior grade of butyl rubber produced at the temperature of dry ice. In producing butyl rubber, a temperature of —153 deg. F. is used, while Flexon is made at —103 deg. F. While results to date are not entirely satisfactory owing to lack of uniformity in the product, it is offered as a rubber producible by a quick method, which may be suitable for retreads.

THIOKOL: Organic Polysulfide

Structure: $(—R—\underset{\underset{S}{\|}}{S}—\underset{\underset{S}{\|}}{S}—)$ where R is an organic radical such as $(—CH_2—CH_2—)$ or $(—CH_2—CH_2—O—CH_2—CH_2)$, depending on aliphatic dihalide used.

Status of Manufacture: First announced in 1932. Manufactured by Thiokol Corp., Yardville, N. J. (Dow Chemical Co.) under U. S. Patent 1,854,423, April 19, 1932, Patrick. Made in several grades and types. Annual production 24,000 tons under present program, 60,000 tons recommended by Baruch committee.

Method of Synthesis: Reaction between organic dihalide and alkali polysulfide. Raw materials used are dependent on type; ethylene dichloride and sodium tetrasulfide give Thiokol A; dichloroethyl ether and sodium tetrasulfide give Thiokol B, etc. The organic compounds, which may be obtained from petroleum products, are chlorinated by chlorine obtained from salt. The sulfides are made from sulfur and alkali.

Vulcanizing and Processing: Vulcanizes with metallic oxides, sulfur being used as an accelerator. Processed on regular rubber machinery by special methods. Lacks tack and adaptability. Is frequently mixed with natural rubber. Reinforcing pigments and modifying agents are added, as with natural rubber.

Properties and Uses: Thiokol is made in several types, from several primary materials. A variety of products, some of which are rubberlike, can be made by varying the kind of polysulfide and hydrocarbon. Some of the products are used in the plastic industry and some as a rubber substitute. The ethylene polysulfides are virtually inert to all organic solvents, including benzol, toluol, xylol, carbon tetrachloride,

lacquers and lacquer thinners, acetone, water, salt solutions, dilute phenol, sulfuric acid, hydrochloric acid, and acetic acid; whereas other types are resistant to petroleum but swell to varying degrees in certain chlorinated and aromatic hydrocarbons. They show excellent resistance to ozone, oxygen, and sunlight but are low in tensile strength, and heat and abrasion resistance.

They burn slowly and have relatively poor electrical properties but good enough for low-voltage insulation. They are not recommended for use at extreme temperatures, as they harden at subzero temperatures and are subject to plastic flow at temperatures slightly above atmospheric. They are highly impermeable and are apparently the most resistant of any of the synthetic rubbers to gasoline, benzene and oil.

Thiokol is not suitable for tire treads, although a new type (N) is said to be suitable for recapping. Used in the automotive industry for coating paper gaskets and also in the manufacture of gasoline and paint-spray, hose, printers' blankets, rubber printing plates, cable coverings.

THIOKOL R D: Type Not Announced, Not a Polysulfide Rubber

Structure: Not given.

Status of Manufacture: Announced in 1942 by Thiokol Corp., Trenton, N. J.

Vulcanizing and Processing: Vulcanizes much like natural rubber; sulfur acts as vulcanizing agent. Does not cure to the hard-rubber state with sulfur. Processes much like natural rubber; plasticized through use of a plasticizer. Shows wide variation of properties according to method of compounding.

Properties and Uses: In the raw state described as tough, resilient, amber-colored solid; specific gravity 1.03; excellent resistance to gasoline, oil, and other solvents, but does not have all the solvent-resistant properties of Thiokol FA; high tensile strength, up to 3000 lbs. per sq. in.; abrasion resistance comparable to natural rubber; low compression set; elongation at break, 400%; good resistance to flex cracking; low permeability to air and gases; good aging characteristics.

ETHANITE: Organic Polysulfide

Structure; see Thiokol.

Status of Manufacture: Date of first reference, 1934; manufactured by Belgian Cracking Co., Belgium.

Method of Synthesis: Polymerization of ethylene dichloride in the presence of a sodium polysulfide solution. The ethylene dichloride is produced by chlorinating the olefins in cracked gas. Properties of the product are apparently like those of Thiokol.

PERDUREN: Organic Polysulfide

Structure; see Thiokol.

Status of Manufacture: Made by I. G. Farbenindustrie, Germany; date of first available reference, 1937.

Method of Synthesis: Reaction product of dichloroethyl ether or di(chloroethyl) formaldehyde acetal with sodium tetrasulfide.

Processing: Like Thiokol; sometimes mixed with Perbunan.

Properties: Types of Perduren have properties in common with the American-made Thiokols.

THIONITE and THIONOC: Organic Polysulfides

Thionite listed in literature as Japanese product obtained from the reaction of ethylene diglycoside with sodium tetrasulfide.

Thionoc A listed as polysulfide rubber, presumably made in Japan.

VULCAPLAS: Organic Polysulfide

Structure; see Thiokol.

Status of Manufacture: Date of first available reference 1940 (refers to British patent 453,850, issued Sept. 18, 1936.) Made by Imperial Chemical Industries, England.

Method of Synthesis: Reaction product of glycerol dichloro- (or dibromo-) hydrin with ammonium or alkali di-or polysulfide.

Methods of vulcanizing and processing like those for Thiokol and its properties are common with the Thiokols, according to available references.

KOROSEAL and KOROGEL: Plasticized Polymerized Vinyl Chloride, Raw Materials Being Vinyl Chloride and Plasticizer

Structure: $[—CH\ Cl—CH_2—]_x$.

Status of Manufacture: Date announced, 1935, by B. F. Goodrich Co.

Vulcanizing and Processing: Not vulcanizable. Plasticized with any number of plasticizers, according to qualities desired. Processed on standard rubber processing equipment. May be milled, molded, extruded, calendered, or coated on fabric or paper, and solutions may be applied by spreading, dipping, or printing.

Properties and Uses: Koroseal is said to refer to a broad class of compositions having properties varying from those of hard rubber to those of a jellied cement. Korogel is a highly plasticized Koroseal and Korolac is a solution of Koroseal in specially selected solvents.

Physical and chemical properties may be varied over a wide range by the choice of plasticizer. Tensile strength is varied from 1000 to 9000 lbs. per sq. in.; elongation may be varied from 2 to 500%; flexing life, if used alone, is 10 times that of natural rubber; tearing strength is equal to that of the best rubber compounds; at atmospheric temperature resistance to abrasion is better than that of rubber. Unsuitable for manufacture of tires as it undergoes plastic flow at high temperatures. Impact strength and volume compressibility similar to those of natural rubber and compression set greater.

Harder types are resistant to virtually all materials except organic compounds containing the nitro or chlorine groups, aliphatic or aromatic ketones, aromatic amino compounds, lacquer solvents, or acetic anhydride. In addition, the plasticizer of the softer grades may be partially extracted by certain oils, gasoline or benzene. Resistant to corrosive chemicals, acids, alkalies, and water; not affected by sunlight, aging, oxygen or ozone, and superior to rubber in resistance to gas diffusion.

Used in the manufacture of process equipment for chemical and allied industries, pipeline coating materials, balloon cloth, chemical tubing, belting, gaskets and packing, clothing and waterproof cloth, special uses in the cable and textile industries. Korogel used as matrix material for plaster of paris, portland cement and ceramics molding.

FLAMENOL: Plasticized Polymerized Vinyl Chloride

Structure: $[—CH\ Cl—CH_2—]_x$.

Status of Manufacture: Date of first reference, 1937; made by General Electric Co.

Properties and Uses: Described as synthetic compound resembling rubber, which serves both as an insulation and a finish for wire and cable. Properties are said to include high dielectric strength, toughness, strength, stability in sunlight and oxygen, stability to ozone and oxidizing chemicals and to oils, solvents, acids, and alkalies, and resistance to flame and moisture.

AGRIPOL: A Chemurgic Product Made from Soybean Oil

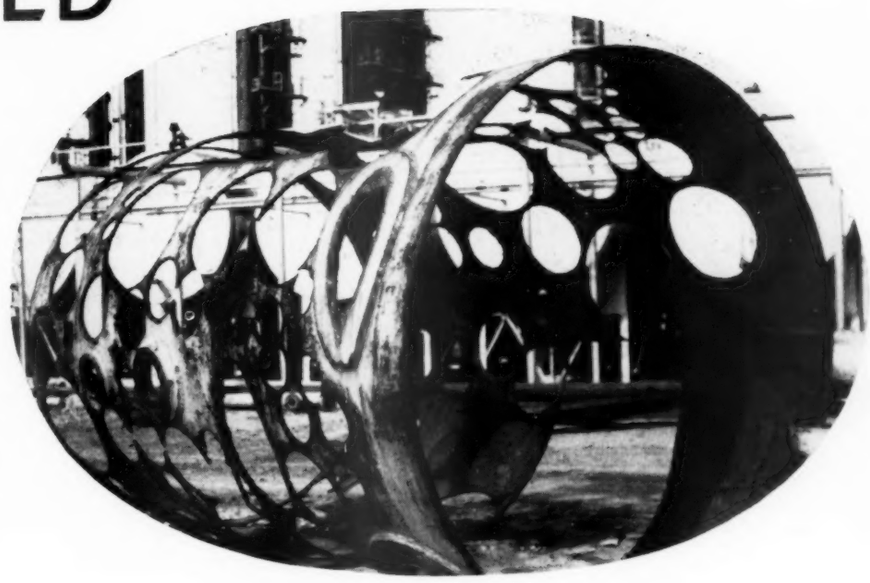
Status of Manufacture: First announced late in 1942, by the manufacturer, Reichhold Chemicals, Inc., Detroit. Announced production for 1943 was 1000 tons a month and annual production of 25,000 tons contemplated.

Method of Synthesis: Polymerization of fatty acids and ethylene glycol. The fatty acids are secured by extraction from soybean oil; ethylene glycol made by dehydration of ethyl alcohol.

Vulcanizing and Processing: Vulcanizing about the same as for natural rubber. Can be worked and formed in existing rubber equipment and compounded with customary fillers used with natural rubber.

Properties and Uses: Announced as inferior to natural rubber in tensile strength and resistance to severe abrasion, hence not suitable for tires. Said to be equivalent to natural rubber in flexibility at low temperatures and superior in aging and resistance to oxidation.

$3,500,000 SAVED



This looks like a moth-eaten tank shell, but the holes are where reinforcing pads for welded pipe connections were cut out by "waste wardens" to conserve material

This Amount was Saved in One Year in an Oil Company Conservation Program. It Represents Critical Materials Some of Which Cannot be Purchased Now at All.

Four thousand tons of material reclaimed to speed construction of a butadiene plant.

80% of the requirements for a "new" gasoline plant salvaged from scrap and used materials.

95% of critical metals for a salt removal plant secured entirely from the scrap pile.

These are only a few of the outstanding accomplishments of the program for conservation of materials of Phillips Petroleum Co., Bartlesville, Okla., in which every one of 10,000 employes is a "waste warden". Through their efforts an estimated $3,500,000 worth of war-scarce materials was saved in 1942 and reports for the first quarter of the current year indicate previous achievements will be greatly exceeded.

"A freight train two miles long would be required to haul the 9294. 6 tons of scrap that were gathered by Phillips Petroleum Co. during 1942—Let's build another two-mile freight in 1943", reads a poster addressed by the company to its workers, for interest in the scrap conservation program is never allowed to lag.

Other examples of equipment made entirely from salvage are: an oil intercooler; two atmospheric cooling coils which required 4000 ft. of antimony admiralty metal tubes; a floating roof for a storage tank; several pipeline systems requiring 3500 tons of salvage pipe, fittings and tanks; as part of the same program, 82,000 steel drums were reconditioned and put back in service.

All of these large savings of material have been made since Phillips Petroleum Co. began its materials conservation program early in 1942, through workers exercising ingenuity, following accepted practices in their daily work, and digging vigorously in scrap piles and dark corners of warehouses, second hand dealers' yards, refineries, bulk terminals and oil field properties. Company officials state there must be no let-up in the work for the duration of the war.

Admittedly, it frequently costs more to recondition equipment or to use salvaged materials than the specific item costs when new. But since it frequently spells the difference between using ingenuity and spending money "to make a part to make a part", or doing without, economics must be relegated to a secondary consideration. The company will not hesitate to spend more for satisfactory reclamation than the cost of new material if a contribution to the war effort is assured.

As a result of this program, well-nigh irreplaceable critical alloys such as are used in still tubes and elsewhere for corrosion resistance have been saved for other uses. This has reduced the load on manufacturers of steel and alloy metals a proportionate amount, permitting fabrication of more war materiel and thus the oil company makes still another contribution to the war effort.

Despite these improvisations the productive capacity of plants and gathering systems has not only been maintained, but in many cases increased a substantial amount. Without the conservation program not only would it have been difficult to keep equipment in good running condition, but much "new plant" construction would have been impossible for lack of equipment.

Butadiene Plant from Scrap

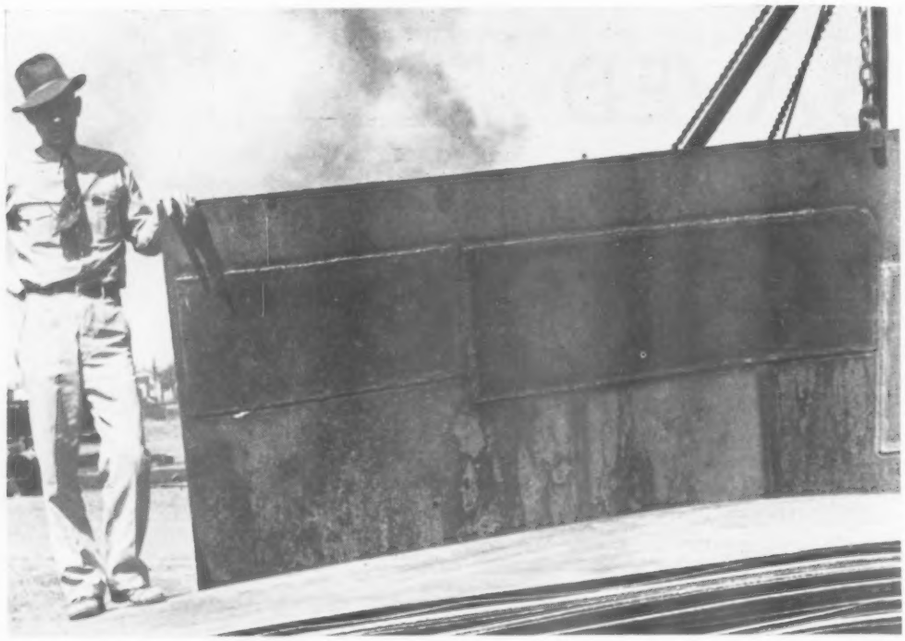
A butadiene plant near one of the company's refineries was fabricated by company construction crews, using reclaimed materials wherever possible. Into this plant went some 4000 tons of second-hand equipment. More than 100 large tanks were salvaged for use as stock tanks and in fabrication of towers. Some were patched, dents removed, unsafe plates replaced; others were rebuilt for high-pressure service; still others were "beheaded" and used to make 108-ft. high smokestacks for boiler houses and other installations. The old heads were saved too, the plate in them helping patch other tanks.

Pipe supports were made from piping otherwise fit only for the junk yard. Ladders and walk-ways for towers were taken from old derricks which were scrapped for their structural steel content. Warehouses, powerhouses, engine houses and like buildings contain no steel superstructure. Instead they were built of wood and required only nails, bolts, nuts and the minimum of necessary hardware in their construction—even to the roof trusses. Compressor engines used in the new butadiene plant are 90% rebuilt. These engines were taken for the most part from other company properties or bought outright from second-hand dealers and reconditioned.

The exteriors of buildings are covered with transite shingles because the usual corrugated iron was not available. Sewers and water lines are of transite and clay tile, non-critical materials. Gratings used in the powerhouse floor are wood instead of the usual steel. Air filters for the engines have wood frames instead of steel. All desks, chairs, cabinets and files are made from wood.

Engines and Compressors Repaired, Rebuilt

Numerous jobs of repairing and rebuilding pumps, engines and compressors have been handled in Phillips Petroleum Co. reclamation work; more will be handled. For example, a



This patched plate, which normally would be scrapped, will be used for tank bottoms and roofs in new installations. Total of 50,000 sq. ft. of such plate has been reconditioned since Jan. 1, 1943, in Phillips Petroleum Co.'s materials conservation program

1920-vintage twin-cylinder 35 Hp. engine was brought in with a badly-cracked combustion cylinder. The break was repaired. The welder had to work in an area only 11 in. in diameter, using mirrors and guessing where his welding rod was part of the time. When the excess weld metal was machined away, the cylinder assembly was ready for another 20 years of service.

Apropos of repairs in general, the company's "Waste Wardens" have found that water jackets in cylinder heads and blocks can be cleaned by introducing cast-iron slugs into the jacket and slowly turning over the head or block in an apparatus which looks much like that employed in barbecuing beef. The slugs "rattle out" the scale and obstructions.

A broken connecting-rod knocked a hole large enough for a man to stick his head through in the crankcase of a big 6-cylinder engine. The wreck was taken to a local engine repair firm but their mechanics refused to tackle the job. The oil company repair department then took over, patching the hole and returning the engine to service in good-as-new condition.

This repair department has found that pump rods can be made from discarded stainless steel polish rods; clutch adjusting screws from worn-out 1½ in. polish rods; cylinder head stud bolts from old sucker rods, wrist pins from junked 3-in. piston rods.

Chrome-silicon valve seats—worn beyond reclaiming by grinding—can be repaired by welding, using old and worn-out valve seats as the welding rod, and finishing by regrinding to proper size.

Plastic parts have been substituted for certain pump parts normally made from brittle alloys containing critical metals which resist chemical corrosion. Bakelite is the material most frequently used as replacement, company officials say, and although usage has not been sufficiently long to warrant drawing positive conclusions, early indications are that the plastic parts will last for an indefinite period.

Gasoline Plant Built From Scrap

The gasoline department has been using much equipment fabricated from salvage. In one plant a new fractionator column was needed badly. Three old absorbers, two 6-ft. in diameter and one 7-ft., were welded together to form a column which weighed more than 75,000 lbs. when completed. The only new part purchased was the cone used to join the 7-ft. diameter section to the 6-ft. section. Trays were salvaged material too, being made from old steel plate.

In the construction of a "new" gasoline plant, more than 80% of the materials required were built of salvage metals. Because compressors are almost impossible to get, and even then deliveries are many times slow, 9 compressor units of 250 Hp. each were built from 165 Hp. compressors.

The automotive division was confronted with the problem of "finding" a transport truck, badly needed by the marketing department. Prospecting around junk yards and truck dealers' establishments, an old 3000-gal. tank was found, purchased, and removed to the repair shops. A junk pile disgorged a van-type trailer badly damaged by fire, and second-hand truck

Salvage of turnbuckle derricks by Phillips Petroleum Co. "Waste wardens" saved 156 tons of reinforcing steel and 32,000 ft. of pipe for new construction

More than 82,000 steel drums have been reclaimed from discard. Here the top seam is being welded after the barrel has been steamed and checked for gas by the safety department

yards produced a discarded tractor which needed a few "incidentals" like a differential, several transmission parts, tires, radiator, and general motor overhaul. Junk yards were combed still further, producing most of the necessary parts for rebuilding the trailer and tractor; the old tank was patched, trailer put under it, the whole combination given a good paint job, and the marketing department had a new fuel transport.

This list of achievements could go on and on. Suffice it to mention just a few more examples:

Old turnbuckle derricks were salvaged, producing 156 tons of reinforcing steel and 32,000 ft. of pipe for "new" construction. Use of red-and-black typewriter ribbons was abandoned; single-color ribbons are used instead, with twice the life. Gunite linings are used in tanks, pressure vessels and towers to prevent corrosion; 11-13% chromium steel was formerly used. Enameled bubble caps and risers are used in corrosion service; light gauge steel where conditions are non-corrosive. Carbon steel is used wherever possible instead of alloy steels.

Welders repairing a crack in a 20-year-old cylinder assembly

Plastic tubing is substituted for steel and copper tubing where required strength and temperature resistance is low. Tanks and cooling towers are made from wood instead of steel; several small wooden tanks can substitute for one large steel tank. Spark plugs and magnetos are used on fencing instead of batteries to keep cattle away from certain installations. Magnetos themselves are rebuilt from usable parts taken from others far beyond repair. Spark plugs also are reconditioned unless the porcelain is broken; then the metal parts are saved or sold as scrap. Valves are entirely rebuilt, also bonnets and stems; pump rods, pistons and valve seats are reconditioned or built up with new metal deposited by welding and metallizing.

Employes Appointed 'Waste Wardens'

In order to stimulate salvage operations among employes, all have been appointed "waste wardens." The outstanding "warden" is selected each month in a company-wide competition, honored in a special publication entitled "Conservation Commando" published every 90 days by the material conservation committee. The "Commando" is entirely devoted to conservation news developing out of the company's many departments, plants and refineries. The first issue came out in January, 1943, the second in May. Circulation is company-wide, and all employes are asked to become regular contributors of ideas and news of accomplishments.

To further stimulate conservation practices, pads of "Suggestion Plan" blanks have been distributed to supervisors, and are available to all employes. Each is asked to jot down any ideas about how use of certain supplies or materials can be eliminated, how a certain piece of equipment could be salvaged and put back into service, or how material now being discarded could be further utilized in some other manner. The completed blank then is mailed to the "suggestion committee" in the home office where it is carefully considered by competent officials, then forwarded to the department or departments more directly concerned for acceptance or rejection.

If accepted the committee determines the amount of cash award to be paid to the employe submitting the suggestion. The award is never less than $5. Whether or not the suggestion merits an award, the submittor receives a letter from the Suggestion Committee.

If the idea is rejected, the letter contains an explanation of why the idea was unworkable. Otherwise, the letter contains an award check.

Fractionator column made from one 7-ft. and two 6-ft absorbers. The only "new" part is the reducing cone joining the two sections. The column weighed more than 75,000 lbs.

The Overall Plate Efficiency of Hydrocarbon Fractionating Columns As a Function of Viscosity*

By H. G. Drickamer and J. R. Bradford**

A correlation between viscosity of the feed stock and plate efficiency has been developed from test data on 54 refinery fractionating columns. The resulting calculations are presented in graphical form and this curve checked from data on 30 commercial columns obtained from the literature, the agreement in general being good. The effect of variation in tray design on the correlation is discussed.

While the primary application of the correlation is to process design calculations, applications to plant operations under the same limiting conditions are suggested. These limits are stated as (1) where the columns are operated at near capacity and (2) where tray designs are similar.

THE plate efficiency of fractionating columns is a function of tray design, column load, temperature and pressure of operation, and physical properties of the material being fractionated. However, for any group of columns having similar tray design and operated near maximum capacity, the overall tray efficiency is primarily a function of the physical properties of the material fractionated at the column temperature and pressure. In petroleum work, stabilizers, debutanizers, butane depropanizers, deisobutanizers, naphtha fractionators, and similar columns come under the above classification, and in most cases, bubble-tray absorbers and strippers may also be considered in the same category.

The plate efficiency is undoubtedly not a simple function of any one physical property. However, it was felt by the authors that a simple, usable correlation could be developed between some fundamental property and plate efficiency. It must be kept in mind that the authors were seeking, not a theoretically derived equation for tray efficiency as a function of some physical property, but merely a property or combination of properties whose variations are consistent with variations in tray efficiency. Naturally it is desirable to conform as closely to theoretical considerations as a simple equation will permit.

Viscosity was selected as the determining physical property for several reasons.

First, the Stokes-Einstein equation for molecular diffusivity

$$D=\frac{KT}{6\pi r\mu}$$

presents diffusivity as an inverse function of viscosity.

Second, the mass transfer equation of Chilton and Colburn[10]

$$K=\frac{Gm}{Mm}\left(\frac{pk_d}{\mu}\right)^{-.67}j$$

denotes turbulent mass transfer as an inverse function of viscosity.

Third, the von Karman[32] equation for film thickness

$$y=\frac{(\text{constant})\mu}{G\left(\frac{f}{2}\right)}$$

indicates that film thickness is directly related to viscosity. The mass transfer is an inverse function of the length of the path, i.e., the thickness of the liquid and vapor films. Since, for the temperatures and molecular weights under consideration, the viscosities of liquid hydrocarbons are 10 to 100 times the viscosities of corresponding vapor hydrocarbons, and further, the rate of change of liquid viscosity with temperature and with molecular weight is 2 to 15 times the rate of change of vapor viscosity, relative liquid viscosity makes the better criterion of film thickness and therefore of relative mass transfer rate and overall tray efficiency.

Fourth, the equation for liquid mass transfer coefficient

$$K_{la}=\frac{3.4}{(\mu)^{.58}}$$

developed from experimental data by Sherwood and Walter,[20] again indicates an inverse relationship between mass transfer rate and viscosity.

Since a preliminary correlation between K_{la} and tray efficiency was quite successful, an inverse relationship between tray efficiency and viscosity was postulated.

Table I presents the results of calculations on tests made on various towers at the Texas City Refinery of Pan American Refining Corp. Figure 1A shows these same results in graphical form. A large part of the data obtained in these tests may be found in Section I at the end of the article.***

Method of Calculation

For each test, the Podbielniak analyses were converted to a molal basis, and a material balance was made around the tower. For fractionating equipment, minimum reflux was calculated by the method presented by Colburn.[11] The minimum number of plates were determined in the manner recommended by Brown and Holcomb[2] calculating one or two plates down from the top and one or two plates from the bottom, then applying Fenske's equation.[13] The number of theoretical plates required at the operating reflux ratio was obtained from the chart by Brown and Martin.[4] Several columns were also calculated by the method of Brown and Souders[6] and by plate

*Presented before the American Institute of Chemical Engineers, New York, May 10-11, 1943. Published in June 25, 1943, Transactions of the Institute, pg. 319.

**Research Laboratory, Pan American Refining Corp., Texas City, Texas.

*** The detailed data on tests on individual tower operations from which the results were calculated as given in Table I and Table IV has been omitted. For Table I it is for 30 tests on various towers at the Texas City refinery and includes; number of plates and plate spacing, tower temperatures and pressures, feed temperature, feed and product rates, and composition of feed, overhead products and bottoms. For Table IV data for 10 tests on each of two commercial columns includes; tower temperatures, pressures, feed temperature, feed and product rates, and composition of feed, overhead and bottoms.

Table I—Tray Efficiencies Calculated from Data from Actual Tower Operations

(See Fig. 1A)

Source: Texas City Plant Test Data — **Reference: Figure 1A**

Tower Type	Aver. Temp. °F.	Average Pressure PSI Abs.	Molal Average Viscosity	Per Cent Tray Efficiency
1. Cracking Unit Stabilizer	312	357	0.066	83.0
2. Cracking Unit Stabilizer	315	347	0.072	84.0
3. Cracking Unit Stabilizer	313	366	0.091	84.2
4. Cracking Unit Stabilizer	314	350	0.098	80.0
5. Cracking Unit Stabilizer	319	363	0.105	81.0
6. Cracking Unit Stabilizer	309	363	0.098	77.0
7. Debutanizer*	275	117	0.165	59.0
8. Deisopentanizer*	280	116	0.160	64.0
9. Deisopentanizer*	270	116	0.172	62.0
10. Deisopentanizer	260	117	0.152	73.0
11. Deisopentanizer	262	116	0.158	67.7
12. Deisopentanizer	264	115	0.162	69.0
13. Cracking Unit Debutanizer	245	115	0.190	60.0
14. Cracking Unit Debutanizer	252	130	0.213	61.5
15. Cracking Unit Debutanizer	248	125	0.210	64.0
16. Butane Depropanizer	162	235	0.148	68.0
17. Butane Depropanizer	161	235	0.170	64.0
18. Poly Plant Stabilizer	228	365	0.220	58.0
19. Poly Plant Stabilizer	198	362	0.222	55.0
20. Poly Plant Debutanizer	238	145	0.310	46.0
21. Poly Plant Debutanizer	242	147	0.322	44.0
22. Poly Plant Absorber	126	255	0.405	42.0
23. Poly Plant Absorber	127	260	0.410	39.0
24. Poly Plant Absorber	124	265	0.500	38.0
25. Poly Plant Absorber	120	260	0.480	36.0
26. Hydroformer Stabilizer	285	350	0.355	44.0
27. Kerosene Stripper	448	68	0.205	57.0
28. Kerosene Stripper	435	68	0.190	64.0
29. Virgin Gas Oil Stripper	507	60	0.250	49.0
30. Virgin Gas Oil Stripper	481	58	0.270	48.0
31. Virgin Gas Oil Stripper	492	60	0.280	52.0
32. Absorber	138	267	0.220	56.4
33. Absorber	132	254	0.310	50.0
34. Absorber	117	94	1.410	10.4

* Bottom 11 trays perforated in tower.

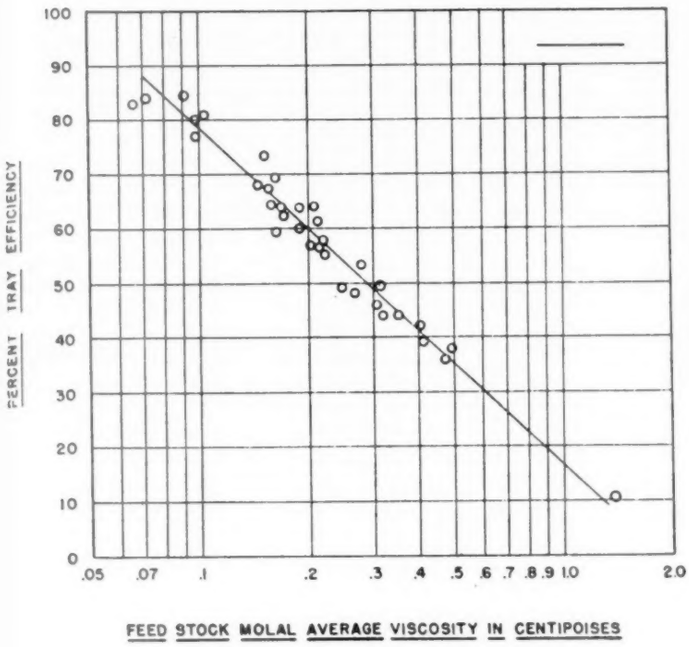


Fig. 1A—Plate efficiencies in relation to viscosity, calculated from tests on commercial towers

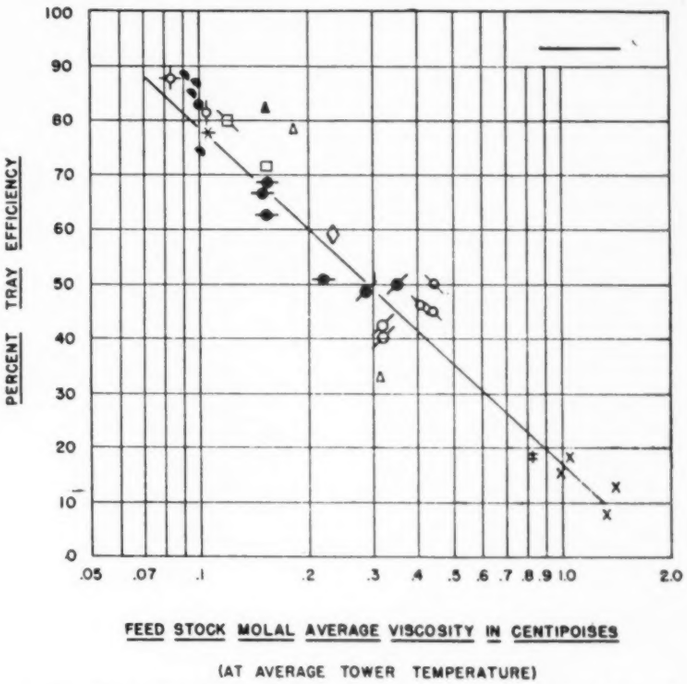


Fig. 1B—Plate efficiencies as calculated from data on fractionating columns available in the literature, plotted on the curve obtained from Figure 1A

to plate calculations with enthalpy balances on each plate. The results obtained by the various methods did not vary by more than a fraction of one theoretical plate. The absorber and stripper tray efficiences were calculated by obtaining the necessary number of plates from the absorption and stripping factor chart,[6] using an effective absorption or stripping factor, and checking top and bottom temperatures by equilibrium and enthalpy balances. The method is substantially the one described by Edmister.[12] The equilibrium constants used in both fractionator and absorber calculations were calculated from fugacity data by Sherwood.[28]

The plate efficiences were plotted against the molal average viscosities of the feed, or, in the case of absorbers, of the rich oil, at the average tower temperature. The molal average viscosity of the feed was selected because, while it has no direct physical significance, it is the most representative value which is easily obtainable in ordinary design work. Further, for light hydrocarbon mixtures the

TABLE 2

Tray Efficiencies Calculated from Data on Fractionating Columns Obtained from the Literature
(See Fig. 1B)

	Source of Data	Symbol	Ref.	Tower Type	Avg. Tower Temp. ° F.	Avg. Pressure Psi-Abs.	Molal Avg. Viscosity	% Tray Efficiency
1.	Atkins and Franklin	‡	1	Absorber	101	78	0.81	18.0
2.	Brown and Holcomb	‡	2	Natural Gasoline Stabilizer	198	215	0.105	82.6
3.	Brown and Lockhart	◇	3	Gasoline Fractionator	197	200	0.100	74.0
4.	Brown and Lockhart	●	3	Gasoline Fractionator	217	250	0.09	88.0
5.	Brown and Lockhart	●	3	Gasoline Fractionator	200	203	0.097	86.0
6.	Brown and Lockhart	●	3	Gasoline Fractionator	205	208	0.095	83.0
7.	Brown, Singer and Wilson	●	5	Naphtha Fractionator	420	14.7	0.23	59.0
8.	Brown, Singer and Wilson	◇	5	†Naphtha Fract. (first 6 plates)	375	14.7	*0.181	78.0
9.	Brown, Singer and Wilson	△	5	†Naphtha Fract. (last 6 plates)	465	14.7	*0.315	33.0
10.	Brown and Souders	◇	7	Absorber	103	485	0.40	46.0
11.	Brown and Souders	◇	7	Absorber	93	485	0.42	45.0
12.	Brown and Souders	◇	7	Absorber	100	60	0.42	50.0
13.	Brown, Souders, Nyland & Hesler	◇	8	‡Natural Gasoline Stabilizer	260	300	0.085	88.0
14.	Burdick	✱	9	Natural Gasoline Stabilizer	193	188	0.106	78.0
15.	Gunness	●	16	Natural Gasoline Stabilizer	196	265	0.102	83.0
16.	Lewis and Wilde	▲	21	†Naphtha Fract. (first 6 plates)	370	14.7	*0.154	82.0
17.	McGiffin	◆	22	Naphtha Fract. (Test #I)	240	135	0.151	63.0
18.	McGiffin	◆	22	Naphtha Fract. (Test #II)	236	125	0.156	69.0
19.	McGiffin	◆	22	Naphtha Fract. (Test #III)	214	125	0.152	67.4
20.	McGiffin	◆	22	Naphtha Fract. (Test #IV)	157	110	0.22	51.0
21.	Nelson	□	23	Natural Gasoline Stabilizer	215	95	0.154	72.0
22.	Sherwood and Jackson	×	29	Absorber	66	92	1.44	8.7
23.	Sherwood and Jackson	×	29	Absorber	60	92	1.58	13.0
24.	Sherwood and Jackson	×	29	Absorber	100	87	1.02	18.4
25.	Sherwood and Jackson	×	29	Absorber	108	87	0.97	15.6
26.	Turner and Rubey	◻	31	Deisobutanizer	154	120	0.120	80.5

* Taken as molal average viscosity of liquid leaving the top and bottom plates of the section.
† All analyses taken from a split-up of true boiling point curves.
‡ Taken on plates below the side drawoff.

TABLE 3
Data for Columns Fractionating Water--Organic Liquid Mixtures

Source	Symbol	Ref.	Tower Type	Avg. Tower Temp. °F.	Avg. Pressure Psi-Abs.	Molal Avg. Viscosity	Per Cent Tray Efficiency
1. Gunness-Baker.	⊘	17	Beer Stills (Perforated Trays)	208	16	0.32	41.0
2. Gunness-Baker.	⊘	17	Beer Stills (Perforated Trays)	210	17	0.32	42.5
3. Peters	⊘	26	Acetic Acid-Water Tower (Sieve Trays)	218	15	0.35	50.0
4. Peters Robinson	⊘	26 27	*Alcohol-Water Tower	200	15	0.29	49.0

* Average of 5 tests on commercial columns with sieve trays.

molal average viscosity seems quite close to the actual viscosity as indicated by these data.

Type of Mixture	Calculated (molal average) Viscosity	Experimental Viscosity
Stabilized Gasoline	.125	.118
Stabilized Gasoline	.110	.123
Debutanized Gasoline	.184	.190
Debutanized Gasoline	.210	.198
180°-340° Cut	.265	.270

The average tower temperature is taken as the arithmetic average of the top temperature and the tower bottom or reboiler outlet temperature. The mol fraction of each component in the feed is multiplied by its viscosity at the average tower temperature. The sum of these partial viscosities is taken as the molal average viscosity. E.g., for a fractionator having an average temperature of 190° F., the plate efficiency is obtained in the following manner:

Component	Mol Fraction	μ 190 F.	M.f.x.μ
C_3	0.2	0.048	0.0096
C_4	0.3	0.112	0.0336
C_5	0.2	0.145	0.0290
C_6	0.3	0.188	0.0564
		Molal Average Viscosity =	0.1286

From Figure 1A, Overall Plate Efficiency = 73%

The molal average viscosity of the feed is relatively easy to obtain since most methods of fractionating tower design require calculation of top and bottom temperatures and the feed composition is generally known. Figures 2A and 2B present available viscosity data[18,19,20,24,25,33] for many hydrocarbon compounds.

The proposed plate efficiency of fractionating equipment may be obtained from Figure 1A or may be calculated from the equation:

$$E = 0.17 - 0.616 \log_{10}(\Sigma Mu)$$

where

E = plate efficiency (ratio of theoretical to actual plates)

This equation, as derived from the above mentioned curve, appears valid for viscosity readings between limits of 0.07 and 1.4 centipoises.

Literature Data

Table II presents results obtained on petroleum fractionating columns available in literature data. In Figure 1B the plate efficiencies of these columns are plotted on the curve obtained from Figure 1A. Where possible, the plate efficiencies were calculated by the methods described for plant test data; however, sufficient data were not always available. In general, the agreement of the literature points to the curve appears to be very good, and a valid explanation exists for the three points (indicated by the symbols △ and ▲) which materially disagree with the correlation. These three plate efficiencies were calculated for only a section of the tower and the compositions were obtained by breaking up true-boiling point curves into normal paraffin components. The theoretical plates were calculated by a modified plate to plate calculation. Since no feed stream existed for these sections of towers, the average composition of liquid leaving the bottom plate and vapor leaving the top plate was used to obtain the molal average viscosity. However, in the case of the naphtha fractionator presented by Brown, et al.,[5] the calculated overall plate efficiency for the entire column is in line with the value taken from the curve.

Table III lists four points obtained for commercial data on beer stills, alcohol-water col-

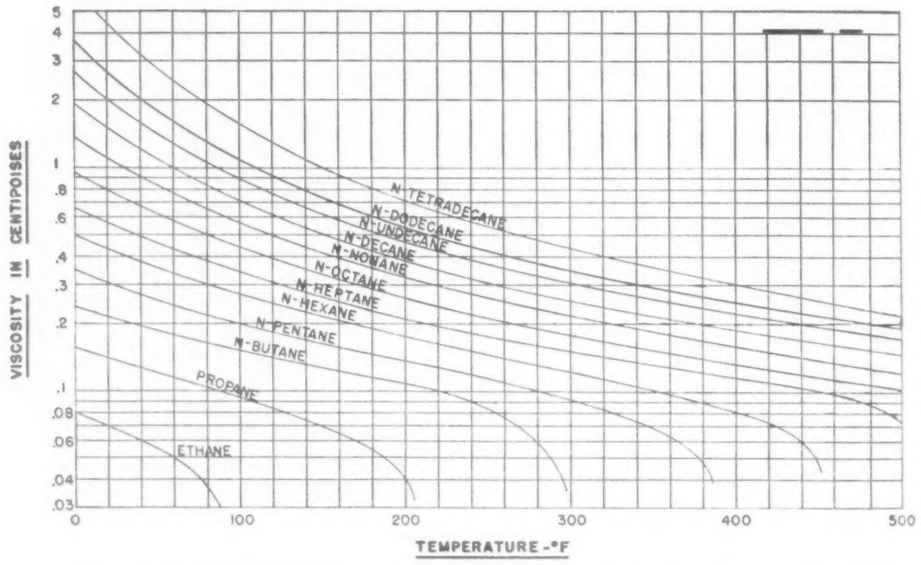


Fig. 2A—Available viscosity data for hydrocarbon compounds

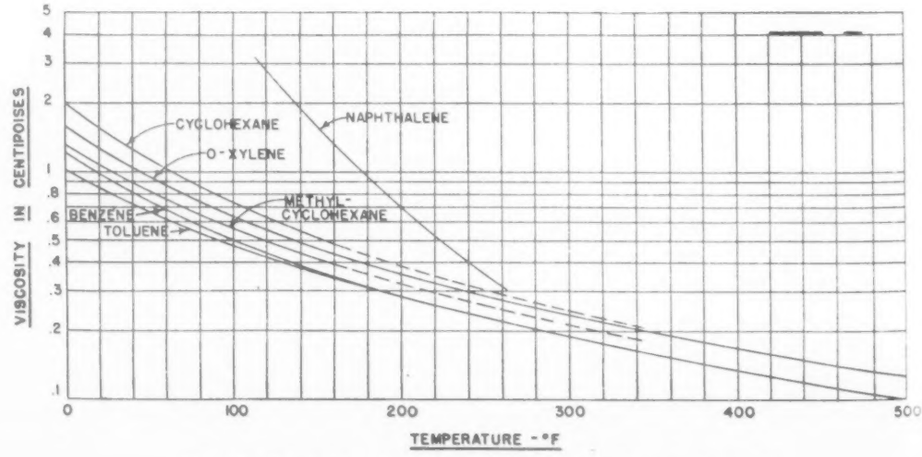


Fig. 2B—Available viscosity data for hydrocarbon compounds

umns, and an acetic acid-water column. While these points, as plotted on Figure 1B, show remarkable agreement with the correlation, the authors do not claim that this or any similar curve will necessarily apply to columns fractionating mixtures of water and miscible organic liquids. The data were presented as a matter of interest and it is hoped that someone with the necessary information available will check the possibilities of a similar correlation.

Effect of Variation in Tray Design

The plant test data presented were taken on towers of standard tray design. However, a considerable range of variation in tray details was noted, as follows:

Riser area: 7.2 — 11.5% of tray area
Minimum liquid downflow area: 4.5 — 9.9% of tray area
Weir height: 1½ in. — 2¾ in.
Weir length: 65 — 80% of tower diameter
Tower diameter: 4 ft. — 0 in. to 7 ft. — 6 in.
Submergence (middle of slot to top of weir): ⅞ in. — 2⅛ in.

There were both single pass and double pass trays.

Caps in all columns except one were rectangular:

Slot width: 3/32 in. — ¼ in.
Slot height: ¾ in. — 1¼ in.

As noted in the data, the bottom 11 trays in one tower are perforated.

It is expected that there is much variation in tray details among the towers calculated from data in the literature.

It was felt that the deviations from the curve in Figure 1A could be attributed to irregularities in plant operation, errors in commercial analyses, and inaccuracies in physical data and method of calculation, rather than to differences in tray design.

To prove this hypothesis, the results of 10 tests on each of 2 commercial columns are presented in Table IV.[1] As can be seen from the table, the charge rate and composition, and reflux rate were kept fairly constant (20% maximum variation) within the range of normal operation.

The average plate efficiency as predicted from Figure 1A or the corresponding equation, are very close to the calculated results. However, the maximum deviations for the two columns are at least as large as any deviations in Figure 1A, and of the order of magnitude of the larger deviations of Figure 1B.

The small variations encountered in standard commercial tray design evidently do not effect the liquid-vapor contacting appreciably under normal column liquid and vapor loads. Furthermore, small variations in tower load seem to have little effect on plate efficiency.

These results do not imply that an improved tray design will not permit an increased normal liquid and vapor load with no loss in tray efficiency, or that wide variations in column load have no effect on tray efficiency. However, the low efficiencies obtained on columns handling viscous liquids, particularly on absorbers, seem to indicate that a standard bubble cap tray is not the ideal method for contacting a viscous liquid and a vapor. Methods of contacting which emphasize breaking up the liquid rather than the vapor, would possibly improve the efficiency of absorption operations.

Summary

Petroleum fractionating equipment of all types indicate a close correlation on the basis of overall plate efficiency. In the case of absorbers, difficulty was sometimes encountered in obtaining similar plate efficiencies for different components in the same test. This may be due to the solubility effect described by Sherwood and Walter[30] or to the difficulty in obtaining accurate equilibrium constant values for lean oil-gas mixtures. The efficiencies used were those of the key components, usually butane and pentane.

Within the limits mentioned in the first paragraph, i.e., (1) where a column is operated near capacity, and (2) with ordinary tray design, such that the factors of submergence, by-passing, entrainment, and flooding may be ignored, the correlation permits a rapid and useful determination of the tray efficiency of refinery fractionating equipment.

Applications in Industry

The primary application of the correlation is to process design calculations; however, the curve may be useful in improving operating conditions as well. For instance, it is apparent from the data that high pressure improves absorber plate efficiency. This would follow from the increased ratio of rich to lean oil and the lighter lean oil in high pressure absorbers. While the operating pressure of absorbers is generally determined by the rich gas pressure, there are cases where an increase in operating pressure is feasible and might result in improved absorption due to an increase in plate efficiency. Furthermore, if a lean oil were selected with regard to its viscosity as well as vapor pressure and other limitations, the plate efficiency might frequently be improved. Other applications to operation will doubtless-

TABLE 4
Results of Tests on Two Commercial Columns

COLUMN I

Key Components: isobutane-normal butane	I	II	III	IV	V
Mols Feed	1801.3	1887.9	1819.2	1971.1	1838.7
Mols Overhead Product	512.4	520.5	453.2	499.8	457.2
Mols Bottom Product	1288.9	1367.4	1366.0	1471.3	1381.5
Mols External Reflux	2075.0	2160.0	2180.0	2310.0	2130.0
Average Tower Temperature—° F.	307	303	302	304	304
Molal Average Viscosity of Feed (at average tower temperature)	0.102	0.112	0.114	0.116	0.107
Efficiency Predicted from Fig. 1A	77.8	75.5	75.1	74.7	77.0
Calculated Efficiency	76.0	75.0	79.0	75.0	83.0
Theoretical Plates from Fig. 1A	12.5	12.1	12.0	11.95	12.1
Theoretical Plates—Calculated	12.2	12.0	12.7	12.0	12.3
Difference	+.3	+.1	—.7	—.05	—.2

Average Efficiency from Figure 1A (for the 10 tests) = 75.6%
Average Calculated Efficiency (for the 10 tests) = 76.7%

COLUMN I

Key Components: isobutane-normal butane	VI	VII	VIII	IX	X
Mols Feed	1810.7	2055.8	1718.2	1684.2	1734.3
Mols Overhead Product	546.2	504.1	443.8	425.7	433.5
Mols Bottom Product	1264.5	1551.7	1274.4	1258.6	1300.8
Mols External Reflux	2040.0	2445.0	2005.0	1980.0	2055.0
Average Tower Temperature—° F.	304	305	302	303	303
Molal Average Viscosity of Feed (at average tower temperature)	0.107	0.112	0.116	0.115	0.116
Efficiency Predicted from Fig. 1A	77.0	74.5	74.7	75.0	74.6
Calculated Efficiency	81.5	74.5	77.0	73.0	73.5
Theoretical Plates from Fig. 1A	12.3	11.9	11.95	12.0	11.95
Theoretical Plates—Calculated	13.1	11.9	12.3	11.7	11.8
Difference	—.8	0	—.35	+.3	+.15

Average Efficiency from Figure 1A (for the 10 tests) = 75.6%
Average Calculated Efficiency (for the 10 tests) = 76.7%

COLUMN II

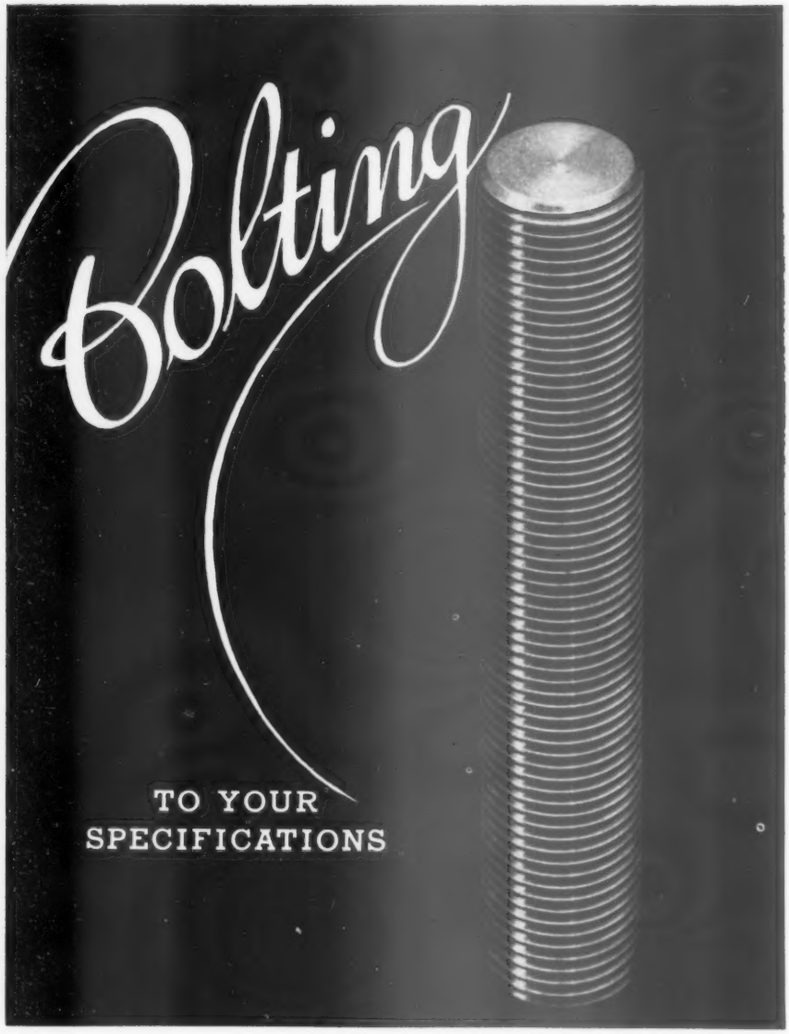
Key Components: isopentane-normal pentane	I	II	III	IV	V
Mols Feed	1288.9	1367.0	1366.0	1471.3	1381.5
Mols Overhead Product	221.3	272.3	252.9	268.4	248.1
Mols Bottom Product	1067.6	1094.7	1113.1	1202.9	1133.5
Mols External Reflux	1091.0	1161.0	1110.0	1119.0	1090.0
Average Tower Temperature—° F.	244	251	254	252	253
Molal Average Viscosity of Feed (at average tower temperature)	0.184	0.186	0.193	0.191	0.196
Efficiency Predicted from Fig. 1A	62.1	62.0	61.0	61.2	60.6
Calculated Efficiency	59.0	56.0	57.0	61.5	61.0
Theoretical Plates from Fig. 1A	16.8	16.75	16.5	16.55	16.4
Theoretical Plates—Calculated	15.9	15.2	15.4	16.6	16.5
Difference	+.9	+1.55	+1.1	—.05	—.1

Average Efficiency from Figure 1A (for the 10 tests) = 59.5%
Average Calculated Efficiency (for the 10 tests) = 58.5%

COLUMN II

Key Components: isopentane-normal pentane	VI	VII	VIII	IX	X
Mols Feed	1264.5	1551.7	1274.4	1258.6	1300.8
Mols Overhead Product	236.5	275.3	222.2	238.3	268.6
Mols Bottom Product	1028.0	1276.4	1052.2	1020.3	1032.2
Mols External Reflux	1065.0	1071.0	1059.0	1162.0	1031.0
Average Tower Temperature—° F.	252	254	254	256	254
Molal Average Viscosity of Feed (at average tower temperature)	0.195	0.198	0.200	0.198	0.199
Efficiency Predicted from Fig. 1A	60.7	60.5	60.1	60.5	60.3
Calculated Efficiency	61.0	66.5	62.5	58.0	57.5
Theoretical Plates from Fig. 1A	16.4	16.35	16.2	16.35	16.3
Theoretical Plates—Calculated	16.5	17.7	16.9	15.7	15.5
Difference	—.1	—1.35	—.7	+.65	+.8

Average Efficiency from Figure 1A (for the 10 tests) = 59.5%
Average Calculated Efficiency (for the 10 tests) = 58.5%



Your Boss Is Our Boss

Today we are both working directly or indirectly for Uncle Sam—so we understand how important it is to concentrate on first things first. Regulations and restrictions set up by our government point the course we all follow. It means many times that personal service that has been so vital a part of our business life and all business life, must give way, temporarily.

The new things we are learning about specialized bolting, coupled with our old time idea on service, will profit our peace time customers when business gets back to normal again.

TO SPEED THE CHALLENGE OF PEACE — BUY MORE BONDS

ERIE BOLT & NUT CO
ERIE, PA., U. S. A.

ly arise as the validity of the curve for various types of fractionation is shown.

Acknowledgment

The authors wish to thank Dr. G. G. Brown of the University of Michigan and Dr. T. K. Sherwood of the Massachusetts Institute of Technology for their helpful suggestions and constructive criticism.

(Written Discussion by H. G. Drickamer)

Since submitting the paper for publication further data has been developed which indicates that the length of liquid path (cross flow effect) must also be considered, particularly on larger towers. Data on a 13½ ft. tower indicate that the correlation would predict an efficiency 18% low. Similarly data on a 10½ ft. tower indicate that the correlation is 8% low in this case.

The columns used in developing the correlation ranged from 4 ft. to 7½ ft. in diameter, and the larger trays were double flow, so that apparent length of liquid path would not vary far from 2½ ft. In the case of the 13½ ft. column, the length of liquid path was 5 or 5½ ft. while for the second (10½) column the length of path was about 4 ft. The data are insufficient to develop a definite correlation, but is is felt that this information might be the basis for further work along these lines.

LITERATURE CITED

1. Atkins, G. J., and Franklin, W. B., *Refiner and Natural Gasoline Manufacturer*, 15, 30 (1939).
2. Brown, G. G., and Holcomb, D. E., *Petroleum Engineer*, p. 55, June, 1940.
3. Brown, G. G., and Lockhart, F., *Trans. Am. Inst. Chem. Engrs.*, 39, 63 (1943).
4. Brown, G. G., and Martin, H. Z., *Trans. Am. Inst. Chem. Engrs.*, 35, 679 (1939).
5. Brown, G. G., Singer, S. C., and Wilson, R. R., *Ind. Eng. Chem.*, 28, 824 (1936).
6. Brown, G. G., and Souders, Mott, *Ibid.*, 24, 519 (1932).
7. Brown, G. G., and Souders, Mott, *Oil and Gas Journal*, 31, 34 (June 23, 1932).
8. Brown, G. G., Souders, Mott, Nyland, H. V., and Hesler, W. W., *Ind. Eng. Chem.*, 27, 383 (1935).
9. Burdick, G., *Oil and Gas Journal*, 30, 26 (April 9, 1931).
10. Chilton, T. H., and Colburn, A. P., *Ind. Eng. Chem.*, 26, 1183 (1934).
11. Colburn, A. P., *Trans. Am. Inst. Chem. Engrs.*, 37, 805 (1941).
12. Edmister, W. C., paper presented at the April 1943 meeting of the American Chemical Society.
13. Fenske, et. al., *Ind. Eng. Chem.*, 24, 483 (1932).
14. Gilliland, E. R., and Robinson, C. S., "Elements of Fractional Distillation," 3rd Ed., McGraw-Hill Book Co., New York, 1939.
15. Glasstone, S., Laidler, K., and Egring, H., "The Theory of Rate Processes," McGraw-Hill Book Co., New York, 1941.
16. Gunness, R. C., *Ind. Eng. Chem.*, 29, 1092 (1937).
17. Gunness, R. C., and Baker, J. G., *Ibid.*, 30, 1394 (1938).
18. International Critical Tables, Vol. 2, p. 146 ff., McGraw-Hill Book Co., New York, 1926.
19. *Ibid.*, Vol. 5, p. 10 ff.
20. *Ibid*, Vol. 7, p. 211 ff.
21. Lewis, W. K., and Wilde, H. D., *Trans. Am. Inst. Chem. Engrs.*, 21, 99 (1928).
22. McGiffin, J. Q., *Ibid.*, 38, 761 (1942).
23. Nelson, W. L., "Petroleum Refinery Engineering," p. 545, 2nd Ed., McGraw-Hill Book Co., New York, 1941.
24. Perry, J. H., "Handbook for Chemical Engineers," pp. 794-5, 2nd Ed., McGraw-Hill Book Co., New York, 1941.
25. *Ibid.*, pp. 1436-43.
26. Peters, W. A., *Ind. Eng. Chem.*, 14, 476 (1922).
27. Robinson, C. S., *Ibid.*, 14, 480 (1922).
28. Sherwood, T. K., "Absorption and Extraction," p. 105 ff., McGraw-Hill Book Co., New York, 1937.
29. Sherwood, T. K., and Jackson, R. M., *Trans. Am. Inst. Chem. Engrs.*, 37, 959 (1941).
30. Sherwood, T. K., and Walter, J. F., *Ind. Eng. Chem.*, 33, 493 (1941).
31. Turner, S. D., and Rubey, A. C., *Refiner and Natural Gasoline Manufacturer*, p. 423, Sept. 1938.
32. Von Karman, Th., *Trans. ASME*, 61, 705 (1939).
33. Wiggins, W. R., "Viscosity-Temperature Characteristics of Petroleum Products," Science of Petroleum, Vol. II, p. 1083 ff., Oxford University Press, New York, 1938.

Technical Section, NATIONAL PETROLEUM NEWS

Published Every Month by

The National Petroleum Publishing Company

Publication Office, 1213 West Third Street, Cleveland 13, Ohio, U. S. A.

V. B. Guthrie, Editor, Technical Section • D. P. Thornton, Jr., Assistant Editor

Contents

Vol. 35, No. 31 — AUG. 4, 1943

Improving Products from Sour Crudes R-339

Shale Oil, Other Substitutes, and the Petroleum Shortage. By B. H. Weil R-348

'M' Day for Refinery Equipment

Alloy Linings Welded in Valve Bodies; New Flange Surface Deposit-Welded. By Everette E. Kerns R-350

Valve Repair Tool Fabricated by Welding. By George M. Heath R-352

Heat Exchanger Restored to Service by Welding on Partial Baffles. By W. H. Parlette R-353

Dished Cast Iron Heat Exchanger Head Is Replaced with Arc Welded Steel. By Harold E. Steinman R-354

Absorber for Hydrocarbon Is Welded from Two Towers. By H. L. Dresser R-354

New Design Practices Recognized in Pressure Vessel Code Addenda. By E. F. Brummerstedt R-356

90,000-Ton Buna-S Plant. By D. P. Thornton, Jr. R-358

Safe Handling of AHF. By Charles M. Fehr R-364

Properties of the Commercial Synthetic Rubbers R-368

$3,500,000 Saved R-375

The Overall Plate Efficiency of Hydrocarbon Fractionating Columns. By H. G. Drickamer and J. R. Bradford R-378

NOTE—The decimal numbers which appear in the margin opposite the headings of articles throughout the Technical Section are for the benefit of readers who use the Uren Decimal Index System in filing and indexing articles.

INDEX TO ADVERTISERS

Technical Section

This index is published as a convenience to the reader. Every care is taken to make it accurate, but National Petroleum News assumes no responsibility for errors or omissions

American Meter Co. R-351
Badger & Sons Co., E. B. .....
Brooks Equipment & Mfg. Co. R-345
Clark Bros. Co., Inc. .....
Erie Bolt and Nut Co. R-382
Filtrol Corp. .....
Foster Wheeler Corp. R-346, R-347
Johns-Manville Corp. .....
Kellogg Co., M. W. .....
Lummus Co. ..... Insert
Monsanto Chemical Co. .....
National Petroleum News R-367
Pennsylvania Salt Mfg. Co. R-361
Petroleum Rectifying Co. of Calif. .....
Platt's War-Oil Communication Services R-383
Sun Shipbuilding & Dry Dock Co. .....
Universal Oil Products R-355
Warren Petroleum Corp. R-363
Wyatt Metal & Boiler Works ..... Outside Back Cover

Refinery Supts.

NEW EDITION OF

PLATT'S

OIL PRICE HANDBOOK

Now Ready

—contains complete record all 1942 petroleum prices

When you want to know what a particular price was on a certain specific date you usually want this information in a hurry. There is no surer way to get it quickly and accurately than by consulting Platt's Oil Price Handbook. This year's edition contains—

FEATURES OF THE 1942 EDITION

- Refinery and Seaboard Daily Prices
- Averages of "Highs", "Lows", Combined "Highs" and "Lows"
- Tank Wagon and Dealer Prices of Gasoline
- Tank Wagon Prices of Kerosine and Naphtha
- Fuel Oil tank wagon prices
- Aviation Gasoline tank wagon prices
- Statistics and Graphs
- Oil River Terminals, Cycling Plants
- Specifications for U. S. Govt. Motor Fuels
- Refinery Directory

Print order for this 1942 edition is strictly limited by war-time restrictions. Since this is a book that every refinery superintendent needs to consult frequently, we suggest that you send in the coupon today. Then you will be sure of having a copy handy when you want it most.

$12.50 per Copy

8443

NATIONAL PETROLEUM NEWS
1213 W. Third St., Cleveland 13, O.

Attached is my check covering ..... copies of Platt's Oil Price Handbook for 1942 at $12.50 per copy.
(Ohio purchasers please add 3% tax to each order)

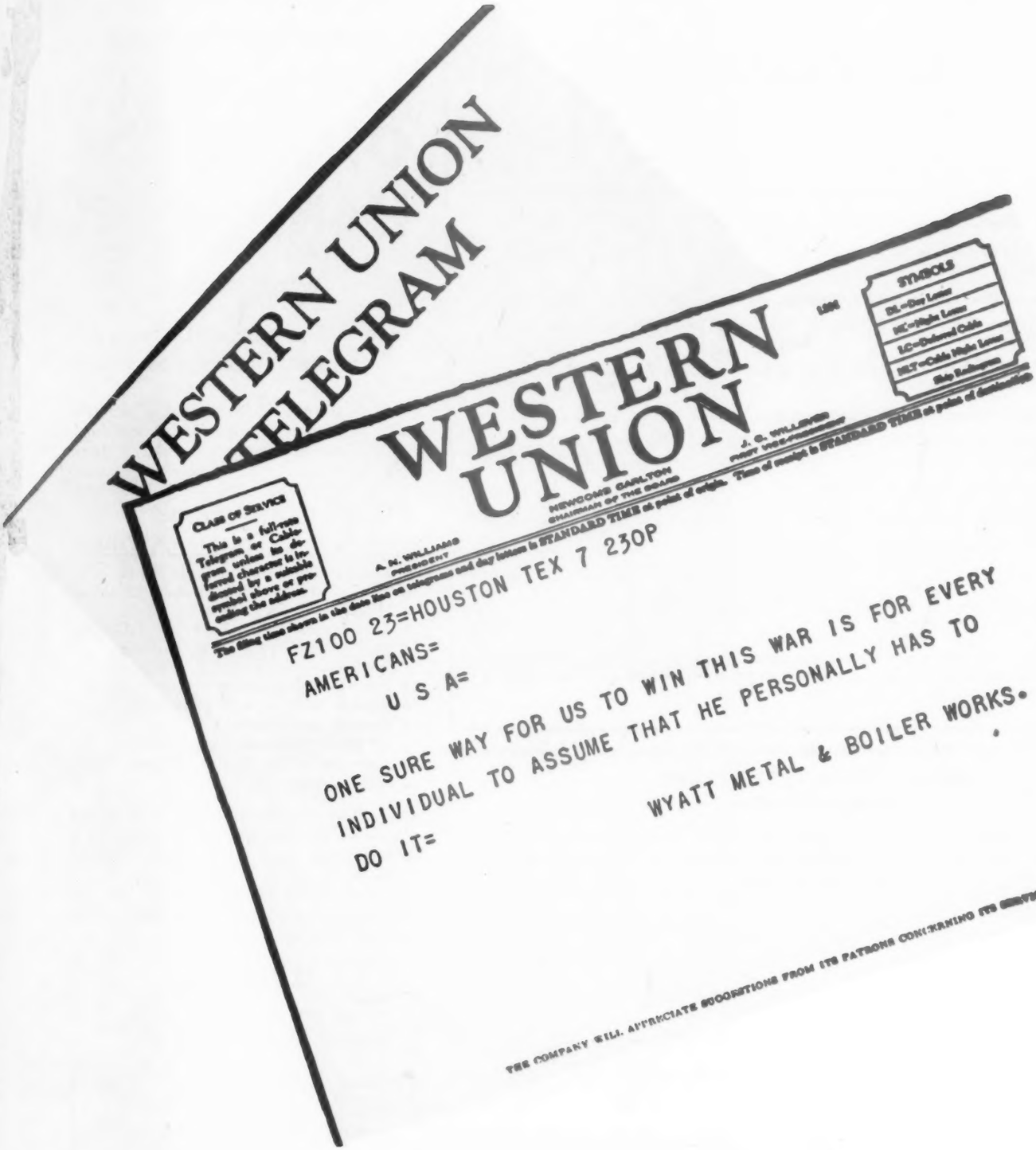
Name .....

Company .....

Address .....

City ..... State .....

Platt's
WAR-OIL COMMUNICATION SERVICES



WESTERN UNION TELEGRAM

WESTERN UNION

NEWCOMB CARLTON
CHAIRMAN OF THE BOARD

J. C. WILLEVER
FIRST VICE-PRESIDENT

A. N. WILLIAMS
PRESIDENT

SYMBOLS
DL=Day Letter
NL=Night Letter
LC=Deferred Cable
NLT=Cable Night Letter
Ship Radiogram

CLASS OF SERVICE
This is a full-rate Telegram or Cable-gram unless its de-ferred character is in-dicated by a suitable symbol above or pre-ceding the address.

The filing time shown in the date line on telegrams and day letters is STANDARD TIME at point of origin. Time of receipt is STANDARD TIME at point of destination

FZ100 23=HOUSTON TEX 7 230P

AMERICANS=

U S A=

ONE SURE WAY FOR US TO WIN THIS WAR IS FOR EVERY INDIVIDUAL TO ASSUME THAT HE PERSONALLY HAS TO DO IT=

WYATT METAL & BOILER WORKS.

THE COMPANY WILL APPRECIATE SUGGESTIONS FROM ITS PATRONS CONCERNING ITS SERVICE